



EPA Region X
START

Superfund Technical Assessment and Response Team



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Musick Mine
Preliminary Assessment/Site Inspection Report
TDD: 03-11-0003-B

EPA Contract: 68-S0-01-02

May 2, 2005

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**PRELIMINARY ASSESSMENT/SITE INSPECTION
REPORT**

Musick Mine
Lane County, Oregon

TDD: 03-11-0003-B

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2 May 2005

Contract No.: 68-S0-01-02
Weston Work Order No.: 12644-001-002-0153-00
Weston Document Control No.: 12644-001-002-AAVP



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LIST OF ACRONYMS

<u>Acronym</u>	<u>Definition</u>
AMD	acid mine drainage
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cfs	cubic feet per second
CLP	Contract Laboratory Program
CLPAS	Contract Laboratory Program Analytical Service
COC	Contaminant of Concern
CRQL	Contract Required Quantitation Limit
CVAA	Cold Vapor Atomic Absorption
CVAFS	Cold Vapor Atomic Fluorescence Spectroscopy
DQI	Data Quality Indicators
DQOs	Data Quality Objectives
EPA	United States Environmental Protection Agency
GPS	Global Positioning System
gpm	gallons per minute
HRS	Hazard Ranking System
IDW	Investigation Derived Waste
ILM	Inorganic Laboratory Method
MQO	Method Quality Objectives
mg/kg	milligrams per kilogram
µg/L	microgram per liter
MDL	Method Detection Limit
MS	Matrix Spike
NPL	National Priorities List
NWI	National Wetland Inventory
ODEQ	Oregon Department of Environmental Quality

LIST OF ACRONYMS *(Continued)*

<u>Acronym</u>	<u>Definition</u>
OLM	Organic Laboratory Method
PA	Preliminary Assessment
PCBs	polychlorinated biphenyls
PPE	Probable Point of Entry
PRGs	Preliminary Remediation Goals
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOP	Standard operating procedure
SQAP	Sampling and Quality Assurance Plan
SQL	Sample Quantitation Limit
START	Superfund Technical Assessment and Response Team
TAL	Target Analyte List
TDD	Technical Direction Document
TDL	Target Distance Limit
USCB	United States Census Bureau
USCS	Unified Soil Classification System
USGS	United States Geological Survey
Weston	Weston Solutions, Inc.
XRF	X-Ray Fluorescence

SECTION 1

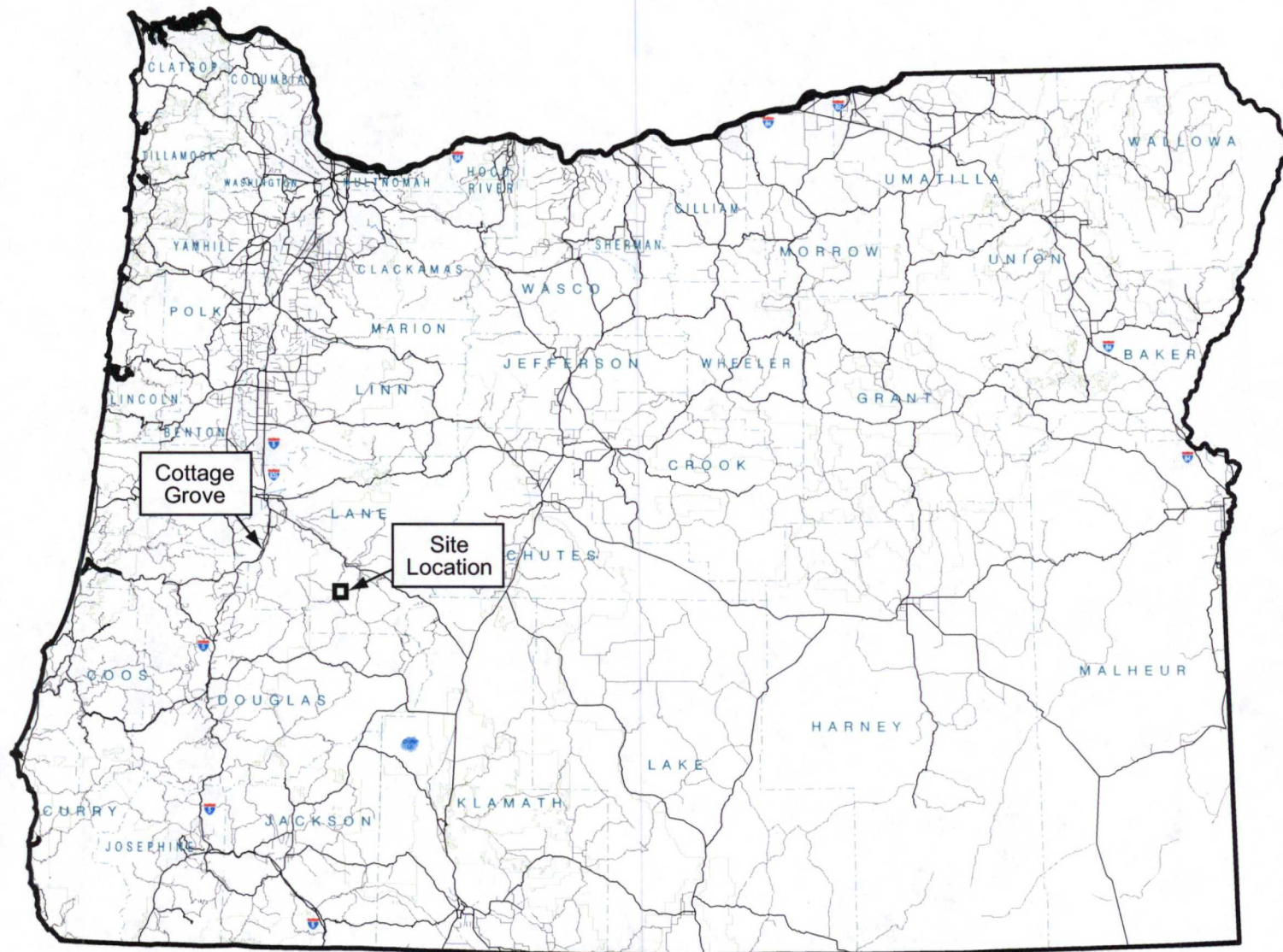
INTRODUCTION

Under the authority of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980 and the 1986 Superfund Amendments and Reauthorization Act (SARA), Weston Solutions, Inc. (Weston) has completed a Preliminary Assessment and Site Inspection (PA/SI) of the Musick Mine, which is located in Lane County, Oregon (Figure 1-1). The United States Environmental Protection Agency (EPA) Region 10 retained Weston to complete this PA/SI investigation pursuant to the EPA Superfund Technical Assessment and Response Team (START) Contract No. 68-S0-01-02 and Technical Direction Document (TDD) No. 03-11-0003-B. The purpose of this report is to provide the EPA with the results of the investigation including: the historical information collected, a discussion of the sampling activities, and the analytical results for the samples collected as part of the investigation.

PAs and SIs are generally the first and second screening investigations, respectively, in a series of assessments that EPA may complete at a known or potential hazardous waste site that is being investigated under CERCLA/SARA prior to its potential inclusion on the National Priorities List (NPL). The combined PA/SI Assessment integrates activities typically conducted during the PA (e.g., information gathering, site reconnaissance) with activities typically conducted during the SI (e.g., development of site-specific Sampling Quality and Analyses Plans, field sampling, filling data gaps) to achieve one continuous site investigation. The main objectives for the PA/SI activities are to:

- Determine if the site is, has, or may have the potential to release hazardous substances to the environment, in order to differentiate between sites that pose little or no threat to human health or the environment from those that may warrant further investigation.
- Identify waste source areas at the site in an attempt to document the presence of hazardous waste substances in these areas.
- Evaluate the threat posed by migration of or exposure to hazardous substances from the site.
- Collect information that can be used to assess the site using EPA's Hazard Ranking System (HRS).
- Help determine whether further investigation of the site under CERCLA/SARA is warranted in order to pursue listing on the NPL.

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Source: Oregon Department of Transportation, Geographic Information Services, 2001.



Site Location Map
Musick Mine PA/SI
Lane County, Oregon
Figure
1-1

SECTION 2

SITE BACKGROUND AND PROBLEM DEFINITION

The following information regarding site ownership, operations, and background was obtained through a review of public records including EPA and Oregon State Department of Environmental Quality (ODEQ) records, interviews with property owners or representatives, and Weston's field sampling investigation conducted in November 2004.

2.1 SITE DESCRIPTION AND BACKGROUND INFORMATION

2.1.1 Site Location

Site Name:	Musick Mine
CERCLIS ID No.:	NA
ODEQ ECSI No.:	2655
Location:	Lane County, Oregon, within the Umpqua National Forest.
Latitude:	43° 34' 42" North
Longitude:	122° 39' 10" West
Legal Description:	Sections 14 and 15, Township 23S, Range 1E, Willamette Meridian
County:	Lane County
Site Owner(s):	Gale Hulihan (Representative) Musick Mining Co-op, Inc. 115 Hansen Lane Eugene, Oregon 97404

2.1.2 Site Description

Musick Mine is an inactive mine of approximately 160 acres that is located about 35 miles southeast of Cottage Grove, Oregon. The mine is located within the Bohemia Mining District at elevations ranging from 4,300 feet to 5,400 feet above mean sea level. Lands surrounding the site are part of the Umpqua National Forest managed by the United States Forest Service. The Umpqua National Forest is primarily managed for timber harvest and public recreation.

The mine consists of Upper Musick Mine, located on the eastern side of the Bohemia saddle, and Lower Musick Mine, located on the western side of the Bohemia saddle. Site features are shown on Figure 2-1. According to the ODEQ, the Lower Musick Mine is mislabeled as the Vesuvius

Mine on the United States Geological Survey (USGS) topographic map shown in Figure 2-1 (ODEQ 2003).

2.1.3 Site Ownership

The Musick Mine, established in 1891, has been owned and operated by several private parties. According to Lane County Tax Assessor records, the mine is currently owned by the Musick Mining Co-op Inc. The Musick Mine consists of 13 patented and three unpatented mining claims including the Alpharetta, Nina, Los Angeles, White Ghost, California, Defiance, Idaho, June, Hazel, Cluckey Fraction, Ophir, Rattler, and Arlington (Callaghan 1938). Figure 2-1 illustrates the overall boundary of the Musick Mine based on a compilation of the above mentioned claim boundaries.

2.1.4 Site Operations and Potential Sources

Musick Mine produced gold, silver, copper, lead, and zinc ore over its operational life. From 1891 to 1901, a 5-stamp mill was used to process ore at the Upper Musick Mine (Callaghan 1938; ODGMI 1951). From 1902 to 1907, mining continued but ore was transported by electric tram to the Champion Mine mill for processing (Taber 1949). In 1935, a 22-ton gravity concentrator mill was built at the site and on-site ore processing resumed. The 22-ton mill produced concentrates until mining operations were shut down in 1937. Additional exploration work was conducted on the western side of the site (Lower Musick Mine) from 1961 to 1962 when a 1,662-foot drift tunnel was completed (ODEQ 2003). Very little additional ore was found in this drift and no commercial mining was conducted. The mine remains inactive today.

When the mine was active, ore was removed from the mineshaft and transported to the on-site mill or the Champion Mine for processing. During on-site processing, ore was transported by electric tram from the adits to the stamp mill, which was used to crush the ore to a powder. When the 22-ton mill was established in 1935, the powder was processed to a concentrate using the gravity concentration method. Non-ore bearing waste rock was stockpiled on site near the adits.

Gravity concentration separates minerals based on differences in their density. Gravity concentration involves passing a slurry of ore and water over a series of riffles (ridged tables that vibrate and separate the gold) to catch heavier gold particles (EPA 1995). Amalgamation, or wetting metallic gold with mercury to form an amalgam, is another recovery technique commonly used by gravity concentration mills.

Contaminants of concern (COCs) associated with the mining activities consist primarily of heavy metals. Waste rock and/or tailings stockpiles at the site may be sources of these metals as they leach and are transported into the surrounding environment. Additionally, elemental mercury from possible amalgamation activities may also be present at the site.

Acid mine drainage (AMD) is an additional potential hazard associated with mines. Acid drainage occurs when pyrite and other sulfide minerals, upon exposure to oxygen and water, oxidize to create ferric ions and sulfuric acid. Catalyzed by bacteria, the ferrous ions react further with oxygen, producing hydrated iron oxide, known as "yellowboy" (EPA 1995). This

combination of yellowboy and sulfuric acid may contaminate surrounding soil, groundwater, and surface water, producing water with a low pH. Acid drainage can lower the pH of surrounding water, making it corrosive and unable to support many forms of aquatic life; vegetation growing along streams can also be affected. Mine water can also carry toxic, metal-bearing sediment into streams, which can adversely affect waterborne plant and animal species. Abandoned mines can produce AMD drainage for over 50 years.

Polychlorinated biphenyls (PCBs) are also potential COCs associated with the mine if electrical equipment was used. PCBs came into use in the U.S. in the early 1930's. The 22-ton mill was in operation from 1935 to 1937 and the ODEQ strategy recommendation report (discussed in Section 2.2 below) noted that PCBs are possible COCs based on possible use of electrical transformers (ODEQ 2003).

2.2 PREVIOUS SITE INVESTIGATIONS

In August 2002, the ODEQ Site Assessment Section conducted a site reconnaissance of the Musick Mine as part of a site assessment performed under a multi-agency program (led by EPA Region 10) to evaluate abandoned mine lands. The reconnaissance was conducted from adjacent properties since access to the Musick Mine was not granted by property owners. A literature review was conducted as part of ODEQ's assessment. ODEQ described the results of the assessment in a strategy recommendation report dated June 9, 2003. The report describes an April 1999 University of Oregon study in which samples were collected from "Musick Mine settling pond fines near City Creek" and "Upper and Lower Musick waste rock". Analytical results are reported which show elevated arsenic, copper, lead, manganese, mercury, and silver relative to ODEQ Level II Screening levels and EPA Region 9 Preliminary Remedial Goals (PRGs). The ODEQ report recommended an expanded preliminary assessment be performed at the mine with a high priority. The expanded assessment was to include characterization of the physical features of the site and comprehensive sampling of all potential sources and affected media. Primary COCs identified were arsenic, copper, lead, manganese, mercury, silver, and zinc.

2.3 PROBLEM DEFINITION AND IDENTIFICATION OF SITE CONCERNS

2.3.1 Problem Definition

ODEQ has determined that a possible threat to human health and the environment exists at the Musick Mine site stemming from historical mining activities. The PA/SI effort reported here was conducted in order to assess the potential threat to human health and the environment posed by the mine site and to help determine whether further investigation of the site under CERCLA/SARA is warranted in order to pursue listing on the NPL.

2.3.2 Potential Sources

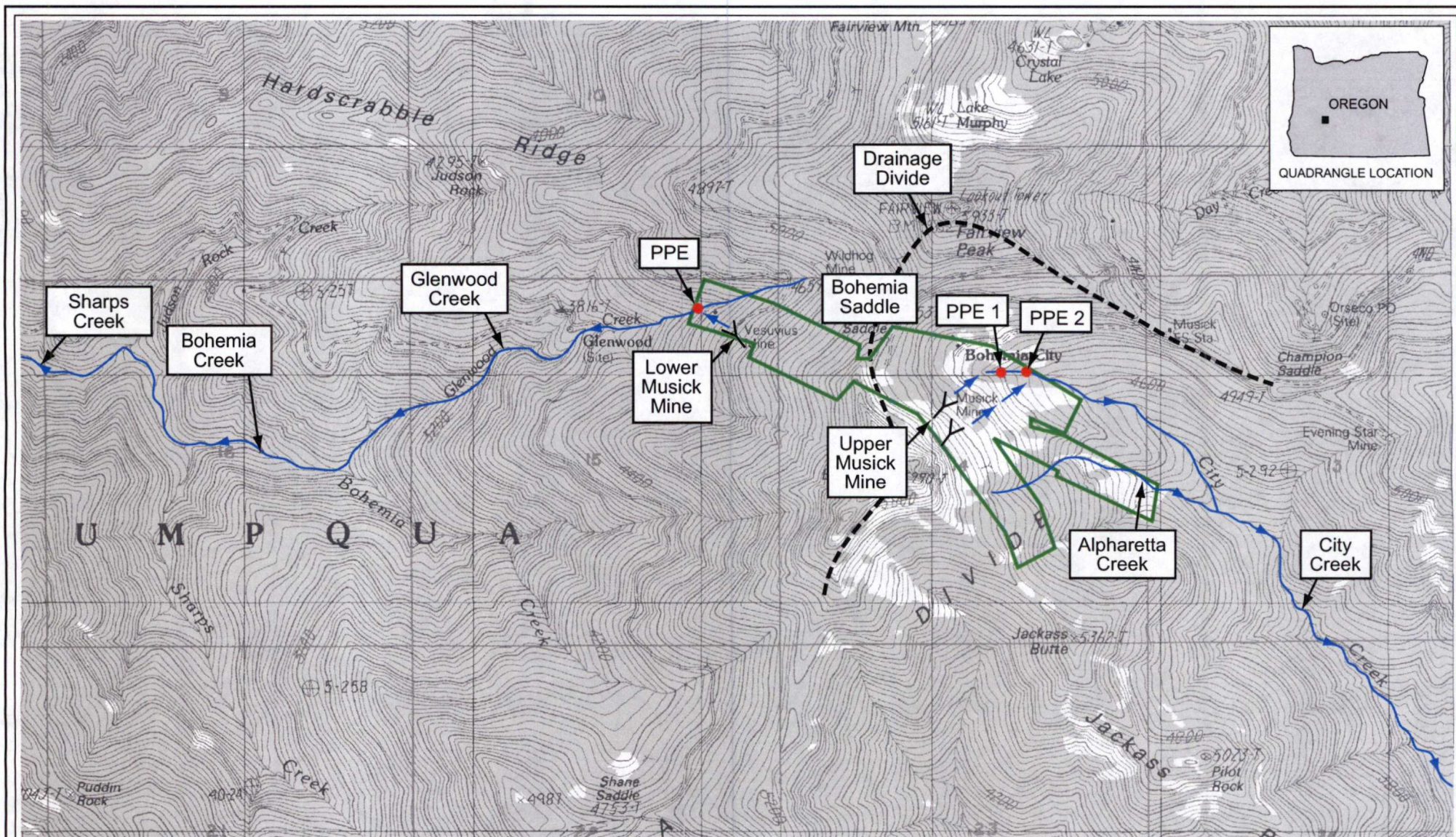
- **Upper Musick Mine** – Based on historical data and the ODEQ reconnaissance, there are two major adits at the Upper Musick Mine site (Figure 2-1). Two large spoils piles are

present at the site, consisting of waste rock placed at the entrance to the two adits. Potential sources identified during PA/SI planning included the two adits, the two waste rock piles, any unidentified tailings piles, the stamp mill location, and the 50-ton ore storage bin location. The COCs identified for these potential sources consist of heavy metals, PCBS (at the stamp mill area), and AMD.

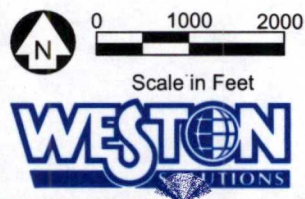
- **Lower Musick Mine** – At the Lower Musick Mine site, one major adit with an associated waste rock pile was identified during PA/SI planning. The waste rock pile is located on the hillside outside of the adit entrance. Potential sources identified for the PA/SI include the adit, the waste rock pile, and any unidentified tailings piles. COCs for these sources consist of heavy metals and AMD.

2.3.3 Potential Targets

- **Streams** – Upper and Lower Musick Mine are located on either side of Bohemia Saddle, which is a drainage divide. Each mine is located near the headwaters of a drainage basin. The Upper Musick Mine area is drained by City Creek, a tributary stream to Steamboat Creek, which drains into the North Umpqua River. The Lower Musick Mine area is drained by Glenwood Creek, the waters of which ultimately drain to the Row River through Sharps Creek. The mine adits and associated waste rock piles are located only a relatively short distance (300 to 1,000 feet) upslope of the streams. COCs may be transported to the streams by surface water runoff carrying contaminated eroded soil, leached metals, and/or AMD. Receptors in the stream environment consist of aquatic species, terrestrial predators, and human fishers.
- **Terrestrial Environment.** Contaminated surface soil at the mine sites presents a potential exposure threat to humans and other terrestrial receptors through contact with and possible inhalation or ingestion of the contaminated soil. Access to the mine sites is blocked by the owners. However, evidence observed during the PA/SI field work indicated that the sites may be periodically trespassed upon by recreational vehicles users and/or hunters.



Source: USGS 7.5' Series Topo, Fairview Peak-OR, 1986.



- Property Boundary
- Probable Point of Entry (PPE)
- Surface Water Flow Direction
- Y Adit

Site Features
Musick Mine PA/SI
Lane County, Oregon

Figure
2-1

SECTION 3

FIELD ACTIVITIES AND ANALYTICAL METHODS

The PA/SI fieldwork was conducted on October 11 through 14, 2004. Field activities were conducted according to the Sampling and Quality Assurance Plan (SQAP) prepared for the project (Weston 2004). The SQAP describes the sampling strategy, sampling methods, and analytical protocols used during the PA/SI.

The locations of all samples collected and analyzed during the PA/SI are presented on Figures 3-1 through 3-3. A summary of sample information including the analyses conducted for each sample is presented in Table 3-1. Source area soil screening results derived using an x-ray fluorescence (XRF) spectrometer are presented in Table 3-2. Photos showing site features and sampling locations are included in Appendix A. Alterations from the SQAP are described in the Sample Plan Alteration Form provided in Appendix B. Copies of the field sampling forms generated during the field work are included in Appendix C.

3.1 SAMPLING APPROACH

3.1.1 Source Sampling

Potential source areas identified during the PA/SI planning process were located and confirmed in the field. Sample locations were selected at the potential sources in areas most likely to contain contamination. Locations were selected based on proximity to known features (such as the adits) or based on in-situ screening for heavy metals using a XRF spectrometer.

At both mine areas, the locations of the waste rock piles, adits, tailings pile, and stamp mill were determined by reconnaissance and with the aid of the owner's representative who escorted the Weston field team during the field work. Waste and tailings pile samples were collected from locations showing the highest metals concentrations determined by XRF spectrometer field screening. Adit sediment and surface water samples were collected at the entrance to each adit where the media existed and was accessible. All samples were submitted for laboratory analysis of target analyte list (TAL) metals. The soil sample from the stamp mill location was also analyzed for PCBs. Measurements for pH were collected in all adit surface waters using pH strips and an electronic meter.

3.1.2 Target Sampling

Surface water and sediment samples were collected from the streams draining each mine area. Samples were collected from each probable point of entry (PPE) location associated with a potential mine source. The PPE locations in the streams were determined visually by following the surface water overland flow pathway from each source area to the affected stream. Downstream locations (up to 6 miles downstream of the mine) were sampled to assess the extent of possible contamination. Tributary streams to the affected streams were sampled if they had the

potential to contain contaminants from other mines. All samples were submitted for laboratory analysis for TAL metals. In addition, the sediment sample collected at the PPE location for the stamp mill was also analyzed for PCBs. All surface water samples were measured for pH using pH paper strips and/or an electronic pH meter.

3.1.3 Background Samples

One background soil sample and two sets of background sediment and surface water samples were collected to assess COC background concentrations in the vicinity of the site. Background sample locations, shown on Figure 3-3, were selected in areas that: 1) are located in the proximity of the Musick Mine, 2) share similar physical characteristics including general bedrock geology (USGS 2000), and 3) have a low potential for impact from mining activities. Assessment of mining activity was based on the mine locations mapped on the 1:24,000 scale topographic quadrangle map for the area (USGS 1997). All background samples were submitted for laboratory analysis for TAL metals. Background soil and sediment samples were also analyzed for PCBs and the pH of each surface water sample was measured.

3.2 SAMPLING METHODS

3.2.1 Soil and Sediment Sampling

Surface soil and sediment samples were collected from between 0 and 4 inches below ground surface (bgs) using dedicated polyethylene scoops. Soil/sediment samples analyzed for PCBs were collected using dedicated stainless steel spoons. During sample collection, material unsuitable for analysis - such as grass, leaves, or rocks - was removed from the sample. Collected material was placed into dedicated polyethylene bowls, homogenized thoroughly, and placed into appropriate sample containers.

All samples were classified according to the Unified Soil Classification System (USCS). The description was recorded on a standardized field sampling form (Appendix C). Samples were stored in iced coolers prior to shipment to the analytical laboratories.

3.2.2 Surface Water Sampling

Surface water samples were collected by submerging pre-preserved sample containers to just below the water surface and allowing them to fill. Care was exercised so that the containers did not overfill and lose preservative. At the Upper Musick Mine adit location, the surface water was very shallow and a new 8-oz analytical soil jar was used as a dipper to fill the sampling container. Samples were stored in iced coolers prior to shipment to the analytical laboratories.

3.2.3 XRF Screening Methodology

During the field sampling event, a portable XRF spectrometer was used to measure metals concentrations at various screening locations at the waste rock pile, tailings pile, and stamp mill locations. The XRF spectrometer is a portable device capable of providing real time field measurements of metals in soil and other solid media. Screening was conducted at up to 15

locations spaced randomly over the surface of each source area. The sample with the highest lead, arsenic, and mercury concentrations at each source area was selected for laboratory analysis. A summary of the XRF screening results is provided in Table 3-2.

3.3 ANALYTICAL METHODS

All samples collected during the PA/SI were submitted for laboratory analyses for TAL metals analysis by Contract Laboratory Program Analytical Service (CLPAS) ILM05.3. In addition, selected samples with the potential to contain polychlorinated biphenyls as Aroclors (PCBs) were submitted for laboratory analysis for PCBs and organochlorine pesticides by CLPAS OLM04.3. TAL metals analysis was performed by Sentinel, Inc. of Huntsville, Alabama. PCBs and Pesticides analysis was performed by Ceimic Corporation Of Narragansett, Rhode Island.

3.4 SAMPLE GLOBAL POSITIONING SYSTEM LOCATIONS

A Trimble GeoExplorer Global Positioning System (GPS) unit with data logging capability was used to record the coordinates of the sample locations. In some cases, adequate satellite coverage was not available at the time of sampling and coordinates were not measured. Logged location data from the GPS unit was provided to EPA GIS services personnel for differential correction to improve location accuracy. Corrected GPS coordinates for each sample are provided in Table 3-1. Corrected GPS coordinates are accurate to within approximately 3 meters.

3.5 INVESTIGATION DERIVED WASTE

Investigation Derived Waste (IDW) generated during the PA/SI sampling effort consisted of used disposable sampling equipment (e.g. bowls and spoons) and protective gloves. All such IDW was disposed of as municipal solid waste in off-site dumpsters.

3.6 SAMPLE HANDLING AND CUSTODY

All chain-of-custody requirements complied with Weston's SOPs for sample handling and sample control. Chain-of-custody procedures followed the *Contract Laboratory Program Guidance for Field Samplers* (EPA, 2001). Samples were identified using the regional tracking numbers assigned by EPA in addition to a unique Weston identification code based on a consistent sample designation scheme presented in the SQAP. Information obtained during sampling was recorded in the project logbook and/or data forms in accordance with the SQAP. Samples were also documented with photographs including sampling location and site features as deemed appropriate.

3.7 SAMPLE IDENTIFICATION NUMBERS

All samples were identified using the EPA and CLP sample numbers assigned by EPA. In addition, all samples were assigned a unique Weston identification number based on a consistent scheme used internally by Weston and in this report.

All sample numbers used consist of four components separated by a dash. These components are site ID, media code, station code, and sample type. The sample designation scheme is as follows:

Site ID		Media Code		Station Code		Sample Type
SSS	-	MM	-	SSsss	-	t [ddd]

The four components are described in the following sections.

Site ID

The site ID component is a three-digit code that designates the specific SI sample. This is based on the Weston project phase code. The Site ID code assigned to this investigation is UMM for Upper Musick Mine or LMM for Lower Musick Mine.

Media Code

The media code is a two-character code that defines the media type of the field sample. The media codes designated for this project are as follows:

SD — Sediment
SS — Surface Soil
SW — Surface Water

Station Code

The station code component is a five-character code that uniquely identifies each sampling station. The station code component has two parts: a two-letter station designation indicating the area where the sample was collected followed by a three number sequential component (i.e., 001, 002, 003). The station codes designated for this project are as follows:

MS — Mine Source
ST — Stream
BK — Background

Sample Type

The sample type component has two parts: a sample type field “t” and a sample depth field “ddd.” The single character “t” indicates a sample type having one of the following values:

0### — Field sample

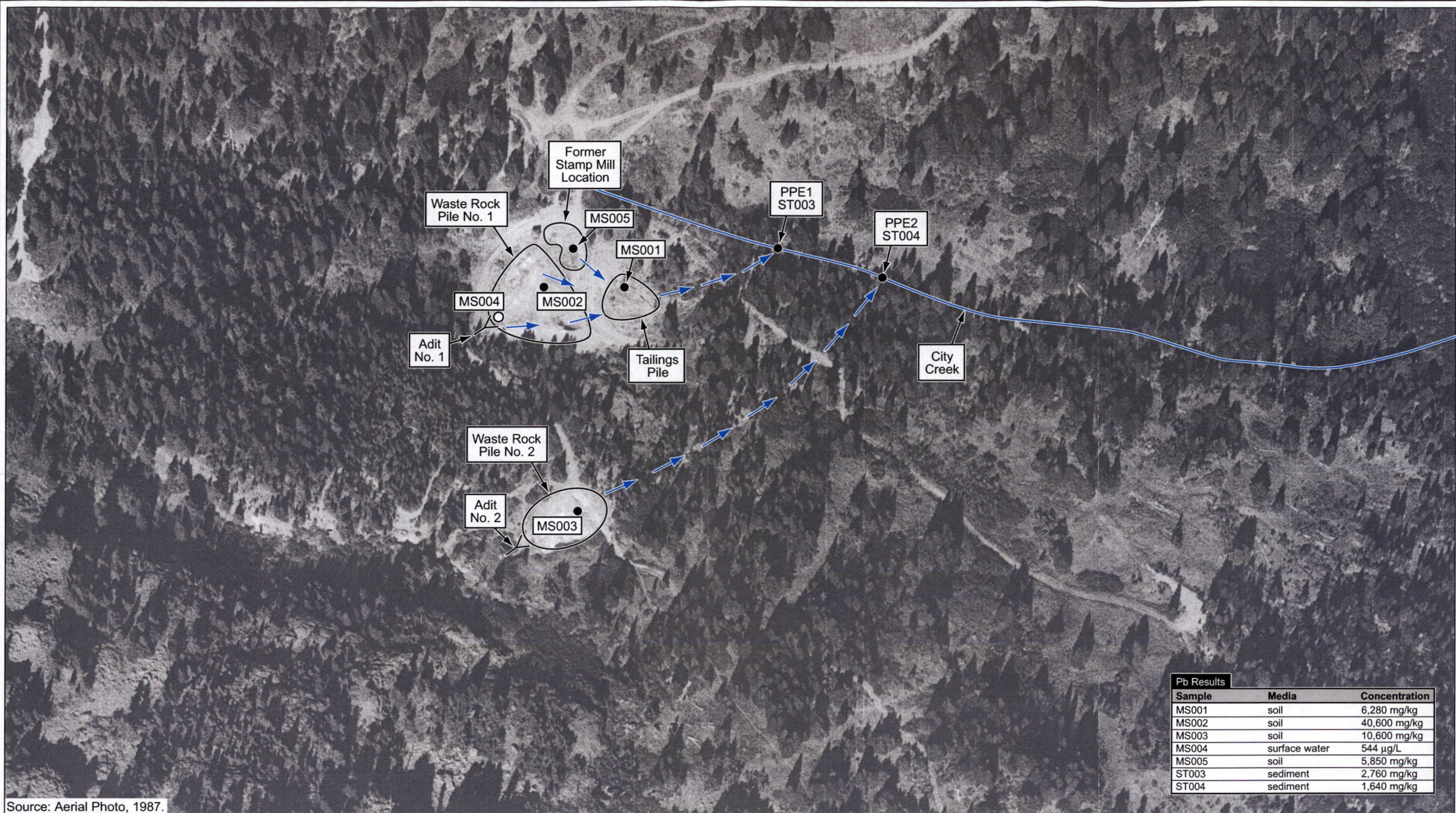
and a three-character field to indicate depth in tenths of feet to the top of the sample:

#000 — 0 foot (surface)

#005 — 0.5 foot


#010 — 1.0 foot

Sample depth determinations were made to the nearest 0.5 foot.




Source: Aerial Photo, 1987.


Pb Results		
Sample	Media	Concentration
MS001	soil	6,280 mg/kg
MS002	soil	40,600 mg/kg
MS003	soil	10,600 mg/kg
MS004	surface water	544 µg/L
MS005	soil	5,850 mg/kg
ST003	sediment	2,760 mg/kg
ST004	sediment	1,640 mg/kg





0100200


Approximate Scale in Feet

 Surface Water Flow Pathway

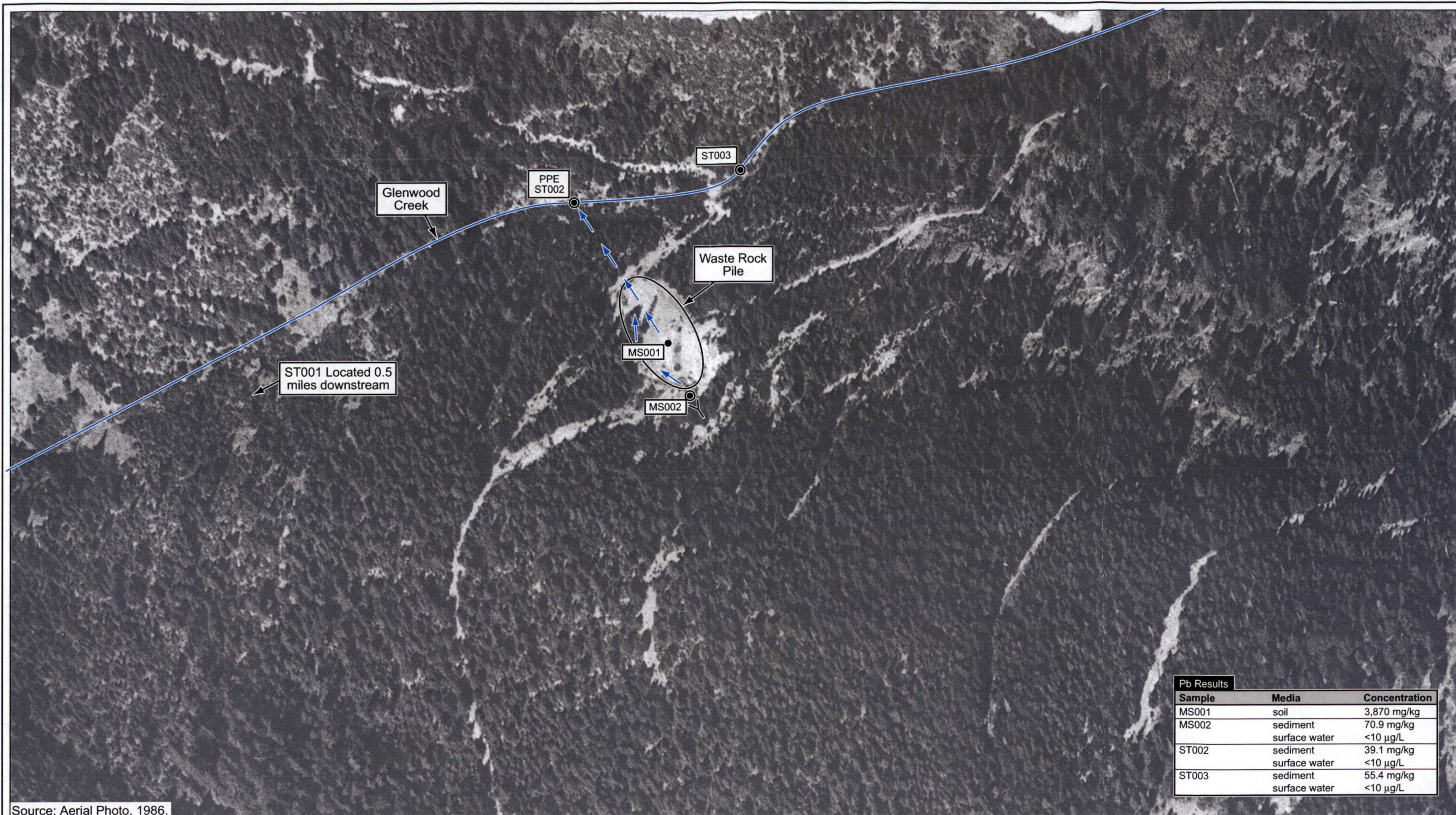
 Adit

 MS001 Soil/Sediment Sample Location and WESTON Sample Station Number

 MS004 Surface Water Sample Location and WESTON Sample Station Number



Upper Musick Mine Sample Location Map
Musick Mine PA/SI
Lane County, Oregon

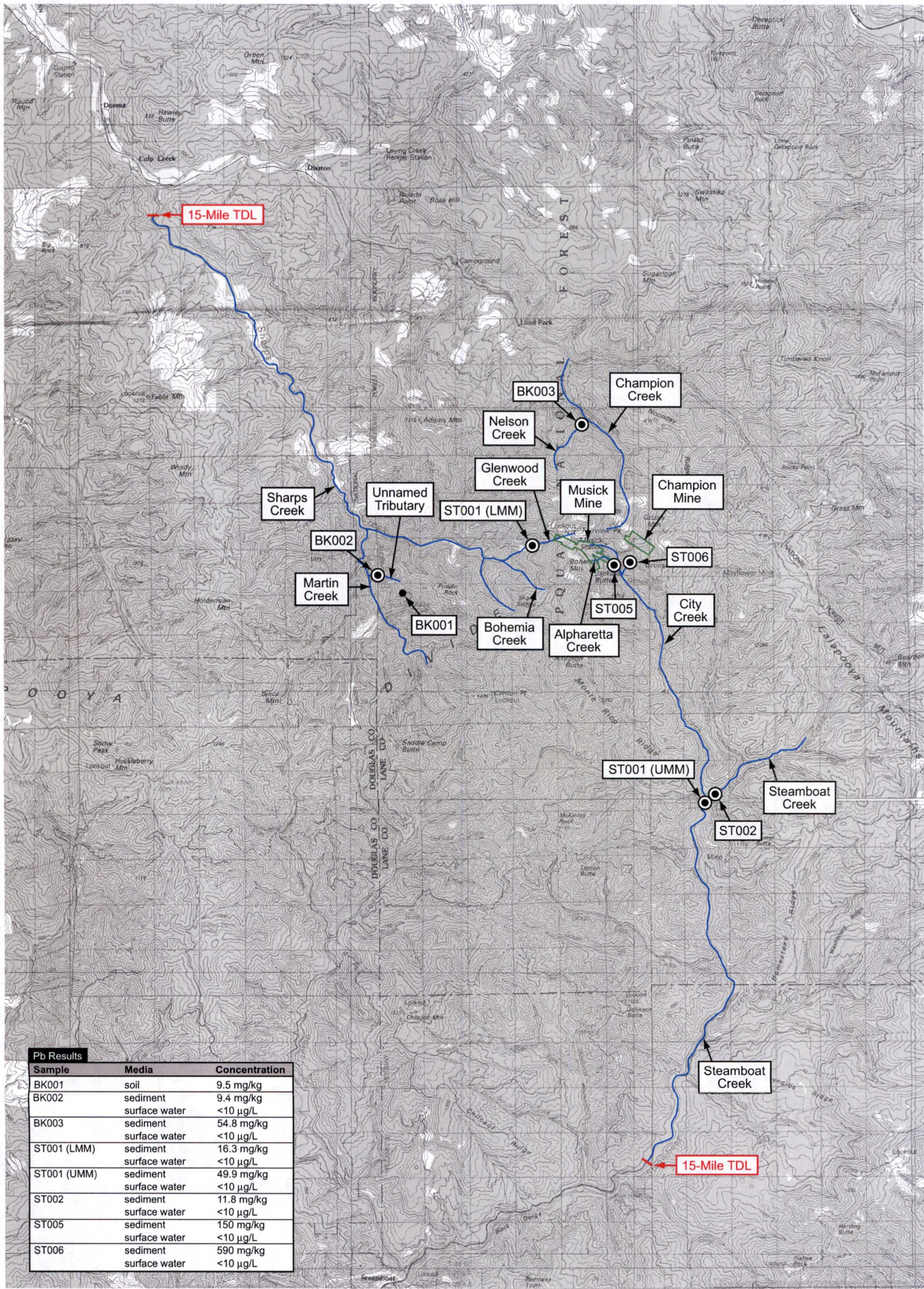


Pb Results		
Sample	Media	Concentration
MS001	soil	3,870 mg/kg
MS002	sediment	70.9 mg/kg
	surface water	<10 µg/L
ST002	sediment	39.1 mg/kg
	surface water	<10 µg/L
ST003	sediment	55.4 mg/kg
	surface water	<10 µg/L



- Surface Water Flow Pathway
- Adit
- MS001 ● Soil/Sediment Sample Location and WESTON Sample Station Number
- MS002 ○ Surface Water Sample Location and WESTON Sample Station Number

Lower Musick Mine Sample Location Map
Musick Mine PA/SI
Lane County, Oregon



Source: USGS 1:100,000 Scale Series Topo, Diamond Lake-OR, 1978 and Oakridge-OR, 1983.



Off-Site Sample Location Map Musick Mine PA/SI Lane County, Oregon

Figure
3-3

**Table 3-1—Sample Information Summary
Musick Mine PA/SI
Lane County, Oregon**

Weston Sample Number	Matrix	Depth Interval (inches)	EPA Regional Tracking Number	CLP Sample Number	Sample Date	Analyses Conducted		Corrected Coordinates*	
						TAL Metals	PCBs		
						Latitude	Longitude		
Upper Music Mine - Mine Waste									
UMM-SS-MS001 - 0000	Soil	0-4	04424051	MJ47S8	10/12/04	X	-	43.5793523°	122.6527142°
UMM-SS-MS002 - 0000	Soil	0-4	04424052	MJ47S9	10/12/04	X	-	43.5794128°	122.6534456°
UMM-SS-MS003 - 0000	Soil	0-4	04424053	MJ47T0	10/12/04	X	-	43.5782763°	122.6532381°
UMM-SW-MS004 - 0000	Surface Water	0-1	04424069	MJ47W6	10/13/04	X	-	43.5792433°	122.6538450°
UMM-SS-MS005 - 0000	Soil	0-2	04424072	(M)J47W9	10/13/04	X	X	43.5795802°	122.6531559°
Upper Music Mine - Stream Samples									
UMM-SW-ST001 - 0000	Surface Water	0-1	04424054	MJ47T1	10/12/04	X	-	43.4998063°	122.5984283°
UMM-SD-ST001 - 0000	Sediment	0-4	04424055	MJ47T2	10/12/04	X	-		
UMM-SW-ST002 - 0000	Surface Water	0-1	04424056	MJ47T3	10/12/04	X	-	43.4999617°	122.5975172°
UMM-SD-ST002 - 0000	Sediment	0-4	04424057	MJ47T4	10/12/04	X	-		
UMM-SD-ST003 - 0000	Sediment	0-2	04424067	MJ47W4	10/13/04	X	-	43.5796529°	122.6516716°
UMM-SD-ST004 - 0000	Sediment	0-2	04424068	MJ47W5	10/13/04	X	-	43.5796167°	122.6516954°
UMM-SW-ST005 - 0000	Surface Water	0-1	04424070	MJ47W7	10/13/04	X	-	NM	NM
UMM-SD-ST005 - 0000	Sediment	0-3	04424071	MJ47W8	10/13/04	X	-		
UMM-SW-ST006 - 0000	Surface Water	0-1	04424075	MJ47X2	10/14/04	X	-	NM	NM
UMM-SD-ST006 - 0000	Sediment	0-2	04284076	MJ47X3	10/14/04	X	-		
Lower Music Mine - Mine Waste									
LMM-SS-MS001 - 0000	Soil	0-4	04424060	MJ47T7	10/13/04	X	-	43.5811673°	122.6651222°
LMM-SD-MS002 - 0000	Surface Water	0-1	04424065	MJ47W2	10/13/04	X	-	43.5810769°	122.6649268°
LMM-SD-MS002 - 0000	Sediment	0-3	04424066	MJ47W3	10/13/04	X	-		
Lower Music Mine - Stream Samples									
LMM-SW-ST001 - 0000	Surface Water	0-1	04424058	MJ47T5	10/13/04	X	-	43.4999617°	122.5975172°
LMM-SD-ST001 - 0000	Sediment	0-2	04424059	MJ47T6	10/13/04	X	-		
LMM-SW-ST002 - 0000	Surface Water	0-1	04424061	MJ47T8	10/13/04	X	-	NM	NM
LMM-SD-ST002 - 0000	Sediment	0-4	04424062	MJ47T9	10/13/04	X	-		
LMM-SW-ST003 - 0000	Surface Water	0-1	04424063	MJ47W0	10/13/04	X	-	43.5822363°	122.6647154°
LMM-SD-ST003 - 0000	Sediment	0-4	04424064	MJ47W1	10/13/04	X	-		

Table 3-1—Sample Information Summary
Musick Mine PA/SI
Lane County, Oregon

Weston Sample Number	Matrix	Depth Interval (inches)	EPA Regional Tracking Number	CLP Sample Number	Sample Date	Analyses Conducted		Corrected Coordinates*	
						TAL Metals	PCBs		
						Latitude	Longitude		
Background—Soil									
LMM-SS-BK001 - 0000	Soil	0-4	04424050	(M)J45S7	10/11/04	X	X	43.5668240°	122.7281742°
Background—Sediment/Surface Water									
LMM-SW-BK002 - 0000	Surface Water	0-1	04424073	(M)J47X0	10/14/04	X	X	NM	NM
LMM-SW-BK002 - 0000	Sediment	0-1	04424074	(M)J47X1	10/14/04	X	X		
UMM-SW-BK003 - 0000	Surface Water	0-1	04424077	(M)J47X4	10/14/04	X	X	NM	NM
UMM-SD-BK003 - 0000	Sediment	0-2	04424078	(M)J47X5	10/14/04	X	X		

Notes:

* Differentially corrected, accurate to approximately 3 meters.

- Analysis not conducted.

CLP: Contract Laboratory Program.

NM: Coordinates not measured due to inadequate satellite coverage at time of sampling.

PCBs: Polychlorinated biphenyls.

TAL: Total analytes list.

**Table 3-2— XRF Spectrometer Field Screening Results
Musick Mine PA/SI
Lane County, Oregon**

XRF Screening Location	Screening Results (mg/kg)			Selected for Analysis
	Arsenic	Lead	Mercury	
Upper Musick Mine - Adit No. 1 Waste Rock Pile				
1	2162	24690	ND	
2	986	7975	73	
3	1466	14453	ND	
4	2088	10777	ND	
5	888	8441	ND	
6	1098	5768	ND	
7	19	86	ND	
8	716	7933	ND	
9	1867	19988	232	X
10	1159	11589	ND	
11	789	7885	ND	
12	1418	20401	65	
13	685	6398	186	
14	436	3598	47	
15	841	10161	ND	
Upper Musick Mine - Adit No. 1 Tailings Pile				
1	266	3729	ND	
2	870	7441	ND	X
3	645	3211	ND	
4	512	3505	ND	
5	355	2593	ND	
6	555	3861	ND	
Upper Musick Mine - Adit No. 2 Waste Rock Pile				
1	524	4426	ND	
2	511	6472	ND	
3	546	3644	ND	
4	919	6360	46	
5	714	3331	56	
6	546	3594	ND	
7	827	673	90	
8	571	5395	52	
9	459	3239	ND	
10	594	3327	ND	
11	710	6028	73	
12	707	6750	184	X
13	583	4379	ND	
14	803	6130	ND	
Upper Musick Mine - Stamp Mill Area				
1	221	3998	77	
2	524	4426	ND	
3	257	1023	ND	
4	488	4661	50	
5	578	9344	96	X

**Table 3-2— XRF Spectrometer Field Screening Results
Musick Mine PA/SI
Lane County, Oregon**

XRF Screening Location	Screening Results (mg/kg)			Selected for Analysis
	Arsenic	Lead	Mercury	
Lower Musick Mine - Waste Rock Pile				
1	238	1626	29	
2	195	1037	42	
3	349	2000	24	
4	198	559	ND	
5	453	4466	84	X
6	261	789	ND	
7	241	1296	ND	
8	276	1114	26	
9	234	166	ND	
10	285	543	ND	
11	285	569	ND	

Notes:

All screening conducted in situ (at ground surface).

ND: Not detected.

mg/kg: Milligrams per kilogram.

XRF: X-ray fluorescence.

SECTION 4

QUALITY ASSURANCE/QUALITY CONTROL

In order to ensure data quality objectives are met, data quality indicators are evaluated to determine sample and laboratory performance. These data, known as Quality Assurance/Quality Control (QA/QC) data, are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware, and reagents due to sample collection, preparation, and analysis activities.

Specific QC requirements for laboratory analyses are incorporated in the *USEPA Contract Laboratory Program Statement of Work (CLP-SOW) for Inorganic Analysis ILM05.3* (EPA 2004) and the *USEPA Contract Laboratory Program Statement of Work (CLP-SOW) for Organic Analysis OLM04.3* (EPA 2003a).

The QC requirements or scope of work requirements were followed for analytical results reported for the *Musick Mine PA/SI Sampling and Quality Assurance Plan* (SQAP; Weston 2004). This section describes the QA/QC measures followed for sample analysis associated with the PA/SI and provides an evaluation for the end-user regarding usability of the data presented in this report.

All samples were collected following the procedures outlined in the site-specific SQAP prepared for this PA/SI. Two laboratories conducted the chemical analysis of samples collected during the PA/SI.

- Sentinel, Inc., located in Huntsville, Alabama, analyzed 11 water and 18 soil/sediment samples for TAL metals following specifications in the *USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis (CLP-SOW) ILM05.3* (EPA 2004).
- Ceimic Corporation, located in Narragansett, Rhode Island, analyzed five soil/sediment samples for organochlorine pesticides/polychlorinated biphenyl compounds as Aroclors (pest/PCB) following specifications in the *USEPA Contract Laboratory Program Statement of Work for Organic Analysis OLM04.3* (EPA 2003a).

EPA quality assurance chemists reviewed all data from analyses performed by CLP. Weston validated all data relative to project data quality objectives (DQOs). Data qualifiers were applied following the *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* ([EPA 2002a], with exceptions noted in Section 1.4.12), *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 1999), and/or criteria specified in the individual analytical methods.

4.1 SATISFACTION OF DATA QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The project data quality objectives for the field effort were designed to produce data of known and documented quality in order to characterize sources, determine off-site migration of contaminants, determine whether the site is eligible for placement on the NPL, and to document threat(s) or potential threat(s) to public health or the environment posed by the site. The DQO process applied to this project followed that described in the EPA document, *Guidance for the Data Quality Objectives Process EPA QA/G-4*, (EPA 2000a).

All samples collected during the PA/SI investigation were analyzed using definitive analytical methods, and EPA accepted all analytical methods employed for this project. The data generated for this project met or exceeded requirements for the definitive data category as defined in the EPA document, *Guidance for the Data Quality Objectives Process for Hazardous Waste Site Operations EPA QA/G-4HW*, (EPA 2000b).

A detailed discussion of the project quality objectives achieved during the PA/SI is presented in the following sections.

4.2 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Quality control checks for sample collection were evaluated by a combination of Chain-of-Custody protocols and laboratory quality assurance as prescribed in the sampling or analytical methods. Quality control samples (e.g., matrix spike/duplicate/duplicate spike samples, blank spike/laboratory control samples, equipment blank samples, ambient/field blank sample) at a frequency of one per 20 samples (or per method) per media were collected during the PA/SI field effort. Results from these samples were compared to each method's criteria and to criteria specified in the SQAP (Weston 2004).

All of the laboratory analyses conducted during this project yielded definitive data. Data quality indicator targets for this project are specified below—DQOs are summarized in the SQAP. Bias on estimated, qualified data was determined and/or confirmed through the validation process. The laboratories' DQO for completeness was 90% for all samples. Precision and accuracy requirements are also outlined in the SQAP (Weston 2004).

4.3 PROJECT-SPECIFIC DATA QUALITY OBJECTIVES

Data quality indicator (DQI) goals—precision, accuracy, representativeness, comparability, and completeness—for this project were developed following guidelines presented in EPA *Guidance for Quality Assurance Project Plans, EPA QA/G-5* (EPA 2002b). The basis for assessing each of the elements of data quality is discussed in the following subsections. Quality assurance objectives for measurement of analytical data (Method Quality Objectives; MQOs) and QC guidelines for precision and accuracy are presented in the SQAP. Other DQI goals are included in EPA analytical methods employed (EPA 2004, 2003).

The laboratory and field team were able to meet overall project DQO goals.

4.3.1 Precision

Precision measures the reproducibility of measurements. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions.

Analytical precision is the measurement of the variability associated with duplicate (two) or replicate (more than two) analyses. When recovery results between different analytical delivery groups are compared, the laboratory control sample (LCS) may be used to determine the precision of the analytical method. In this case, the comparison is not between a sample and a duplicate sample analyzed in the same batch. Rather, the comparison is between the sample and samples analyzed in previous delivery groups. A LCS may be prepared and analyzed within a given batch; in this case, the analytical precision is associated with a particular preparation and analysis sequence.

Total precision is the measurement of the variability associated with the entire sampling and analysis process for one sampling event. It is determined by analysis of duplicate or replicate field samples and measures variability introduced by both the laboratory and field operations. Field duplicate samples and matrix duplicate spiked samples may be analyzed to assess field and analytical precision, and the precision measurement is determined using the relative percent difference (RPD) between the duplicate sample results.

The laboratory was able to meet project DQOs for precision.

4.3.2 Accuracy

Accuracy is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systemic error. It reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike or standard. Analytical accuracy is measured by comparing the percent recovery of analytes spiked into an LCS (blank spike) or into a field sample (to prepare a matrix-spiked sample or matrix-spiked duplicate sample) to a control limit.

The laboratory was able to meet project DQOs, with the exceptions listed in Section 4.4 below.

4.3.3 Representativeness

Representativeness is a measure of the degree to which data accurately and precisely represent a population, including a sampling point, a process condition, or an environmental condition. Representativeness is the qualitative term that should be evaluated to determine that measurements are made and physical samples collected at locations and in a manner resulting in characterizing a matrix or media. Subsequently, representativeness is used to ensure that a sampled population represents the target population and an aliquot represents a sampling unit.

The field team was able to meet project DQOs.

4.3.4 Comparability

Comparability is the qualitative term that expresses the measure of confidence that two data sets or delivery groups can contribute to a common analysis and evaluation. Comparability with respect to laboratory analyses pertains to method type comparison, holding times, stability issues, and aspects of overall analytical quantitation. The following items are evaluated when assessing data comparability:

- Determining if two data sets or delivery groups contain the same set of parameters.
- Determining if the units used for each data set are convertible to a common metric.
- Determining if similar analytical procedures and quality assurance were used to collect data for both data sets.
- Determining if the analytical instruments used for both data sets have approximately similar detection levels.
- Determining if samples within data sets were selected and collected in a similar manner.

To ensure comparability of data collected during this investigation to other data that may have been or may be collected for the site, standard sample collection and measurement techniques were used.

The field team was able to meet project DQOs.

4.3.5 Completeness

Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not rejected through data validation. The requirement for completeness for this project is 90% for all samples.

The following formula is used to calculate completeness:

$$\% \text{ completeness} = \frac{\text{number of valid results}}{\text{number of possible results}}$$

For this investigation, all samples are considered critical. Therefore, standard collection and measurement methods were used to achieve the completeness goal. All laboratory data were reviewed for usability, and all project data were determined to be useable.

The project DQO of 90% for completeness was met.

4.4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PARAMETERS

The laboratory data also were reviewed for technical holding time compliance, blank samples contamination, laboratory control sample recovery, interference check sample recovery, duplicate sample analysis, matrix spike/duplicate spike sample analysis, and serial dilution performance.

These parameters are described below in more detail, and sample-specific detail (including qualification of individual analyte results for associated samples) is provided in the data validation memoranda. Direction of bias is also described in the individual data review memoranda (Appendix D).

4.4.1 Holding Times

All analyses were completed within the technical holding times; no qualification of the data was required on this basis.

4.4.2 Blank Sample Results

All blank sample analyses met the frequency and recovery criteria, with the following exceptions.

- Aluminum, antimony, barium, beryllium, cadmium, copper, manganese, selenium, and zinc were detected in one or more (unspecified) blank samples at concentrations above their respective contract-required quantitation limit (CRQL). Results for these metals in the associated, affected samples were qualified as non-detected (U) at the reported concentration.

4.4.3 Calibration Check Sample Analysis

All calibration check sample analyses met acceptance criteria for frequency and recovery.

4.4.4 Laboratory Control Sample Analysis

All laboratory control samples analyzed met frequency and recovery criteria; no qualification of the data was required on this basis.

4.4.5 Inductively Coupled Plasma-Atomic Emission Spectroscopy—Interference Check Sample Analysis

All ICP-AES interference check sample analyses met frequency and recovery criteria; no qualification of the data was required on this basis.

4.4.6 Serial Dilutions

Serial dilution analysis met all frequency and recovery criteria, with the following exception.

- Beryllium and magnesium serial dilution precision failed to meet the acceptance criterion for percent difference. All associated results were qualified as estimated concentrations (J),

unknown bias (K). The EPA reviewer indicated possible low bias associated with these results; however, the calculation reports the absolute value of the difference between native and diluted concentrations – as such, it is not possible to assign direction of bias. This reviewer assigned unknown bias (K) to the detected beryllium and magnesium results

4.4.7 Duplicate Sample Analysis

Duplicate sample analysis was performed for the metals analyses. All frequency and precision criteria were met.

4.4.8 Matrix Spike Sample Analysis

All matrix spike analyses met frequency and recovery criteria, with the following exceptions.

- Recovery of antimony and lead were less than the lower control limit from one or more matrix spike samples. Recovery of antimony (and sometimes lead) from solid matrices is known to be problematic, unless excess chloride is added (EPA SW846 Method 3050B, Section 7.5). All associated, affected sample results for antimony and lead were qualified as estimated (J). Detected antimony and lead results were qualified as possible low bias (L); non-detected antimony and lead results for the associated, affected samples were qualified by this reviewer as unknown bias (K).

4.4.9 System Monitoring Compound (Surrogate) Spike Analysis

Surrogate spike recoveries met method acceptance criteria; no qualification of the data was required on this basis.

4.4.10 Internal Standards Analysis

Internal standards analysis was not used for samples analyzed during this project.

4.4.11 Detection Limits

Sample results that fall between the method detection limit (MDL) and the Practical Quantitation Limit (PQL) are flagged as estimated concentrations (J), with an additional concentration qualifier 'B' for inorganic analytes. No organic analytes were detected in samples analyzed for this project. This is described further in Section 4.4.12.

All detection limits met project data quality objectives.

4.4.12 Other Data Assessment

The EPA reviewer followed the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94/013 (1994) in reviewing the metals data. This guidance does not reflect recent changes made to the CLP SOW ILM05.3; for the purpose of this review, the 2002 version of the *Functional Guidelines* was followed.

For ILM05.3, the laboratory is required to flag all detected results below the CRQL with a 'J' concentration qualifier (result below the CRQL but above the MDL). In order to maintain consistency with previous START PA/SI reports, and as an aid in the HRS scoring, the 'J' concentration qualifier is appended with the 'B' data validation qualifier.

For the *Inorganic Functional Guidelines* review, the '+' and '-' bias flags are replaced with 'H' and 'L' flags to indicate potential high and low bias, respectively. The 'K' flag is used to indicate unknown bias. This approach is consistent with EPA Region 10 policy.

Bias associated with estimated, non-detected values is unknown and flagged as such, since the reporting limit cannot be determined.

The data, as qualified, are ACCEPTABLE and can be used for all purposes specified in the SQAP.

SECTION 5

ANALYTICAL RESULTS EVALUATION CRITERIA AND BACKGROUND SAMPLES

PA/SI analytical data were evaluated according to the criteria described below. Background sampling activities and analytical results are also described.

5.1 ANALYTICAL RESULTS EVALUATION CRITERIA

Analytical results for source and target samples are presented in summary tables in Sections 6 and 7. Each table presents background sample concentrations followed by the analytical results of samples collected for that particular media. Background sample concentrations were used for comparison purposes to determine detections at or above background in the source and target samples. Concentrations of analytes detected above the sample quantitation limits (SQLs) are presented in bold typeface. Analytical results that are significantly above background concentrations are underlined in addition to the bolding. For the purposes of this investigation, significant concentrations are:

- Equal to or greater than the sample's SQL—if the analyte was not detected in the background sample(s) collected for that media.
- Equal to or greater than the background sample SQL when a background concentration was detected below it's SQL.
- At least three times greater than the background concentration when the background concentration equals or exceeds it's SQL.

Based on EPA Region 10 policy regarding common earth crust elements, aluminum, calcium, iron, magnesium, potassium, and sodium are listed in the tables; however, the concentrations were not evaluated or discussed in the text.

For reference, sample analytical results were compared to screening concentrations in the results summary tables. Screening concentrations consist of EPA Region 9 Preliminary Remedial Goals (PRGs), ODEQ Level II screening levels for soil, fresh surface water, and freshwater sediments, and ODEQ pH criteria for fresh water.

5.2 BACKGROUND SAMPLE LOCATIONS AND ANALYTICAL RESULTS

The locations of the background samples are shown on Figure 3-3. For brevity, the Weston sample numbers used on the figure consist of the sample station identifiers. This convention is used throughout this report.

The background soil sample at station BK001 was collected in an undeveloped forested location off of Puddin Rock Road. As shown in Table 6-2, the sample contained detectible concentrations

of common earth crust elements and arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, vanadium, and zinc. No PCBs were detected.

Figure 3-3 also shows the locations of the two background surface water and sediment sampling stations BK002 and BK003. Sampling station BK002 was selected on an unnamed tributary to Martin Creek, which drains into Sharps Creek. This sample location was selected to represent background conditions in the Sharps Creek drainage, which contains Glenwood Creek. Background sampling station BK003 was selected on Nelson Creek, a tributary to Champion Creek. This sampling station was selected to provide a range of background data for the mine area. No background samples were collected within the City Creek/Steamboat Creek drainage because no accessible background locations were identified during the PA/SI.

Results for the two background surface water and sediments samples are presented in Tables 5-1 and 5-2. Metals detected in the surface water samples include common earth crust elements and zinc. The pH values (measured using the pH meter) for the tributary to Martin Creek and for Nelson Creek were 6.9 and 6.0 respectively.

In the background sediment samples, detected metals include the common earth crust elements and arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, vanadium, and zinc. As shown in Table 5-2, the sediment sample from Nelson Creek exhibited distinctly higher concentrations of cadmium, lead, and zinc as compared to the Martin Creek tributary sample. These results present some uncertainty as to whether the Nelson Creek sample is representative of background concentrations. Comparison of the background sample results to general regional background levels cannot be made because regional levels have not been established for the Musick Mine area (ODEQ 2004). A sampling effort conducted by the USGS in 1996 (USGS 1996) provides metals results which may be indicative of background conditions in the Steamboat Creek drainage. The report for the study presents results for a sediment sample collected from Steamboat Creek in an area thought to be unaffected by mining. The reported concentrations for cadmium, lead, and zinc for this sample were below those for the Nelson Creek sample and similar to the Martin Creek tributary sample. Using lead as an indicator, the results for the three sediments samples discussed here are: Martin Creek tributary - 9.4 milligrams per kilogram (mg/kg) lead (estimated), Nelson Creek - 54.8 mg/kg lead (estimated), and the USGS Steamboat creek sample - 14 mg/kg lead. This data indicates that the background range for lead in the mine vicinity is on the order of 9.4 to 14 mg/kg, below the Nelson Creek value of 54.8 mg/kg. Based on this comparison, the sample from Nelson Creek was not considered a valid background sample for the purposes of this PA/SI and all source and target surface water and sediment samples were evaluated based on the Martin Creek tributary background sample.

**Table 5-1—Results Summary for Background Surface Water Samples
Musick Mine PA/SI
Lane County, Oregon**

Description	ODEQ Level II Screening Levels for Fresh Surface Water ^{1, 2}	Background Surface Water	
Weston Sta. Number		BK002	BK003
EPA Number		04424073	04424077
CLP Numbers		MJ47X0	MJ47X4
Location		Unnamed Tributary to Martin creek	Nelson Creek
Metals (ug/L)			
Aluminum	87	236	237
Antimony	1600	60.0 U	60.0 U
Arsenic	150	10.0 U	10.0 U
Barium	4	27.7 U	8.6 U
Beryllium	5.3	5.0 U	5.0 U
Cadmium	2.2	5.0 U	5.0 U
Calcium	116000	9540	2820 BJK
Chromium	74	0.55 BJK	0.91 BJK
Cobalt	23	50.0 U	50.0 U
Copper	9	25.0 U	25.0 U
Iron	1000	26.3 BJK	100 U
Lead	2.5	10.0 U	10.0 U
Magnesium	82000	1940 BJK	500 BJK
Manganese	120	1.5 U	0.63 U
Mercury	0.77	0.20 U	0.20 U
Nickel	52	40.0 U	40.0 U
Potassium	53000	971 BJK	407 BJK
Selenium	5	35.0 U	35.0 U
Silver	0.12	10.0 U	10.0 U
Sodium	680000	4970 BJK	2870 BJK
Thallium	40	25.0 U	25.0 U
Vanadium	20	50.0 U	50.0 U
Zinc	120	12.3 BJK	60.0 U
pH Field Measurements			
pH by Paper	6.5-8.5 ³	6.5	5.5
pH by Meter		6.9	6.0

Notes:

¹ Aquatic species, provided in Table 1 of Oregon Department of Environmental Quality (ODEQ) document *Guidance for Ecological Risk Assessment*.

² Screening levels for contaminants that bioaccumulate are in the process of being reviewed by ODEQ and may be revised in the future.

³ pH criteria for fresh water, Oregon Administrative Rules 340-41-0021.

Bold type indicates the sample concentration is above the SQL.

BJ: The analyte was positively identified between the MDL and SQL. The associated numerical result is an estimate because the concentration is below the SQL.

CLP: Contract Laboratory Program.

K: Unknown bias.

SQL: Sample Quantitation Limit.

U: The analyte was analyzed for but not detected. The associated numerical value is the SQL.

ug/L: Micrograms per liter.

**Table 5-2—Results Summary for Background Sediment Samples
Musick Mine PA/SI
Lane County, Oregon**

Description	ODEQ Level II Screening Levels for Freshwater Sediment ^{1,2}	Background Sediment	
Weston Sta. Number		BK002	BK003
EPA Number		04424074	04424078
CLP Numbers		(M)J47X1	(M)J47X5
Location		Unnamed Tributary to Martin creek	Nelson Creek
Metals (mg/kg)			
Aluminum	NA	8350	13100
Antimony	3	0.65 UJK	0.50 UJK
Arsenic	6	20.5	26.2
Barium	NA	140	71.6
Beryllium	NA	0.65 JLK	0.70 JK
Cadmium	0.6	0.19 U	0.83
Calcium	NA	1610	1790
Chromium	37	4.2	2.3
Cobalt	NA	5.8 BJK	8.2
Copper	36	7.3	18.0
Iron	NA	25900	21800
Lead	35	9.4 JL	54.8 JL
Magnesium	NA	1640 JK	3410 JK
Manganese	1100	824	903
Mercury	0.2	0.04 BJK	0.010 BJK
Nickel	18	2.8 BJK	3.3 BJK
Potassium	NA	833	512 BJK
Selenium	NA	0.90 U	0.61 U
Silver	4.5	1.2 U	1.2 U
Sodium	NA	97.4 BJK	576 U
Thallium	NA	3.0 U	2.9 U
Vanadium	NA	20.9	22.9
Zinc	123	40.0	176
PCBs (mg/kg)			
All analytes		ND	ND

Notes:

¹ Provided in Table 2 of Oregon Department of Environmental Quality (ODEQ) document *Guidance for Ecological Risk Assessment*.

² Screening levels for contaminants that bioaccumulate are in the process of being reviewed by ODEQ and may be revised in the future.

Bold type indicates the sample concentration is above the SQL.

BJ: The analyte was positively identified between the MDL and SQL. The associated numerical result is an estimate because the concentration is below the SQL.

CLP: Contract Laboratory Program.

J: The analyte was positively identified. The associated numerical result is an estimate.

K: Unknown bias.

L: Low bias.

mg/kg: Milligrams per kilogram.

NA: Not Available.

PCBs: Polychlorinated biphenyls.

SQL: Sample Quantitation Limit.

U: The analyte was analyzed for but not detected. The associated numerical value is the SQL.

SECTION 6

POTENTIAL SOURCE CHARACTERIZATION

Field activities and results of samples collected at the potential source areas are presented below. Source areas and associated sampling locations are shown on Figures 3-1 and 3-2.

6.1 MINE SITE RECONNAISSANCE

Both the Upper and Lower Musick Mines were accessed via gravel roads through locked gates. Site access was provided by the site owner's representative, who accompanied the Weston Field team during all of the field work on mine property. At both mines, the main access road terminated at a cleared, open area once the center of mine operations. No structures related to mine operations remain standing. Both sites are located on the slopes of Bohemia Saddle and are steeply sloped and heavily forested where not cleared. Prior to sampling, a reconnaissance of each mine site was conducted to locate the major site features identified during the project planning process. In addition, the sites were assessed for additional features not previously identified. All of the potential source areas identified during planning were located. An exception is the former location of the 50-ton ore bin at the Upper Musick Mine, which was not found. It is likely that this bin was formerly located in the vicinity of the stamp mill. No additional significant potential source areas were identified beyond those identified during project planning. A former oil storage tank is present at the Upper Musick mine in the former operations area. No evidence of oil releases from the tank was observed. Source sampling activities and analytical results are discussed in the following sections.

6.2 UPPER MUSICK MINE SOURCES

6.2.1 Adits

Based on site observations, two adits were used for commercial ore production at the Upper Musick Mine site. These adits, named adit numbers 1 and 2 in this report, were easily located. Several additional exploratory adits were observed at the site during the reconnaissance; however, these adits were dry and no significant amount of waste rock or tailings were observed nearby. According to the site representative, exploratory adits that were not used for ore production are common in the mine area. Since they did not appear to be significant, the exploratory adits were not investigated.

Adit number 1, shown on Figure 3-1 and in Photo 1 (Appendix A), is located near the main mine operations area. The entrance to the adit has been blocked with rubble to prevent access. A small rivulet with a flow of perhaps 5 gallons per minute (gpm) was flowing from the adit. The surface water flow generally dissipated into the waste rock pile at the entrance to the adit. A surface water sample was collected from the rivulet (MS004). A sediment sample was not collected because the sediment at the adit entrance was covered by rubble. Adit number 2 is located

approximately 400 feet upslope of adit number 1 and is approximately 80 feet higher in elevation (Photo 2, Appendix A). The entrance to adit number 2 was also blocked by rubble. No surface water or sediment sample was collected at the adit because the adit was dry and no apparent signs of past intermittent flow from the adit were observed. According to the owner's representative, the adits are interconnected and all drainage from the mine flows from adit number 1.

The surface water sample collected from adit number 1 was analyzed for TAL metals. The pH of the surface water was also measured as an assessment for AMD. Sample results are provided in Table 6-1. Nine metals were detected in the sample in addition to common earth crust elements. Of these nine metals, concentrations that are significantly above background are arsenic at 24.3 micrograms per liter (ug/L), cadmium at 48.5 ug/L, copper at 650 ug/L, lead at 544 ug/L, manganese at 674 ug/L, and zinc at 9,010 ug/L. The pH value measured using the pH meter was 3.2. This value, in addition to the presence of high concentrations of dissolved metals in the adit surface water, establishes the presence of AMD. Note that lead results are shown on Figure 3-1 as an illustration of the distribution of metals at the site.

6.2.2 Tailings Pile

A tailings "pile" was observed adjacent to an area of debris and scrap lumber identified by the owner's representative as the former gravity concentrator (Photos 3 and 4, Appendix A). The pile currently consists of tailings that have been spread by surface water runoff into a 3- to 4-inch thick layer. As shown on Figure 3-1, surface water from the lower mine operations area, including flow from adit number 1, flows through the tailings pile towards City Creek. The tailings pile is roughly 75 feet long and 40 feet wide at its widest point. These dimensions correspond to a surface area of 1,500 square feet and an estimated volume of 20 cubic yards (using an average thickness of 4 inches). A total of six locations on the surface of the tailings pile were screened for metals using an XRF spectrometer (Table 3-2). A single soil sample was collected based on the XRF screening (MS001). The soil sample was analyzed for TAL metals.

Sample results are presented in Table 6-3. A total of 21 metals, including common earth crust elements, were detected in sample MS001. Metals detected at concentrations significantly above background consist of antimony at 84.9 mg/kg, arsenic at 611 mg/kg, cadmium at 2.2 mg/kg, chromium at 5.3 mg/kg, copper at 928 mg/kg, lead at 6,280 mg/kg, mercury at 16.9 mg/kg, silver at 14.9 mg/kg, thallium at 4.2 mg/kg, and zinc at 824 mg/kg.

6.2.3 Waste Rock Piles

During mine operations, waste rock was deposited outside the entrance of each of the two adits. Waste rock pile number 1, located at the entrance to adit number 1, covers approximately 21,600 square feet of ground surface and has an average estimated height of 25 feet (Photos 5 and 6, Appendix A). These dimensions correspond to an estimated pile volume of 20,000 cubic yards. Waste rock pile number 2 is located at the entrance to adit number 2 (Photos 7 and 8, Appendix A). The pile covers a ground surface area of approximately 5,500 square feet and has an average estimated height of 25 feet. These dimensions correspond to an estimated pile volume of 5,000 cubic yards.

Screening for metals using an XRF spectrometer was conducted at 15 locations on waste rock pile number 1 and at 14 locations on waste rock pile number 2. A single soil sample was collected from each pile based on the XRF screening (MS002 and MS003). Both soil samples were analyzed for TAL metals.

Sample results are presented in Table 6-3. A total of 22 metals were detected in samples MS002 and MS003. Metals detected at concentrations significantly above background consist of antimony at 118 and 383 mg/kg, arsenic at 707 and 938 mg/kg, cadmium at 2.8 and 6.5 mg/kg, chromium at 4.8 mg/kg, cobalt at 7.4 mg/kg, copper at 1,170 and 1,250 mg/kg, lead at 10,600 and 40,600 mg/kg, mercury at 10 and 15.5 mg/kg, selenium at 5.6 and 10.2 mg/kg, silver at 14.5 and 60.5 mg/kg, thallium at 4.6 and 4.9 mg/kg, and zinc at 1,270 and 1,980 mg/kg.

6.2.4 Stamp Mill

The former stamp mill was located adjacent to waste rock pile number 1 as shown on Figure 3-1. Currently, the remains of the mill consist of a 10-foot by 15-foot concrete pad and wooden foundation debris (Photo 9, Appendix A). The total area of the former stamp mill is approximately 2,700 square feet. Five locations within the stamp mill area were screened for metals using an XRF spectrometer. A single soil sample was collected based on the screening (MS005). The sample was analyzed for TAL metals and PCBs.

Sample results are provided in Table 6-3. A total of 22 metals were detected in sample MS005. Ten metals were detected at concentrations significantly above background including antimony at 38.2 mg/kg, arsenic at 248 mg/kg, cadmium at 1.5 mg/kg, chromium at 4.5 mg/kg, cobalt at 8 mg/kg, copper at 466 mg/kg, lead at 5,850 mg/kg, mercury at 24.3 mg/kg, silver at 9.5 mg/kg, and zinc at 526 mg/kg. PCBs were not detected.

6.3 LOWER MUSICK MINE

6.3.1 Adit

A single adit was identified at the Lower Musick Mine during the site reconnaissance (Figure 3-2 and Photo 10, Appendix A). The adit was used for exploration as described in Section 2.1.4 and not commercial production. At the time of the field work, the entrance to the adit was unobstructed and small stream with a flow rate of approximately 10 gpm was flowing from the adit. The stream flowed down slope towards Glenwood Creek before infiltrating below ground at a point approximately 250 feet from the creek. A single surface water sample was collected from the adit entrance (MS002). In addition, sufficient sediment was available to allow for collection of a sediment sample. Both samples were analyzed for TAL metals. The pH of the surface water was measured using a pH meter.

As shown in Table 6-1, the only metals besides common earth crust elements detected in the surface water sample were manganese at 351 ug/L and zinc at 175 ug/L. Both concentrations are significantly above background. The measured pH in the surface water was 7.58, a result not indicative of AMD. Results for the sediment sample are provided in Table 6-2. Of the 21 metals detected in the sample, nine were present at concentrations significantly elevated above

background. These nine metals consist of antimony at 25.9 mg/kg, arsenic at 184 mg/kg, cadmium at 3.4 mg/kg, cobalt at 16.6 mg/kg, lead at 70.9 mg/kg, mercury at 0.4 mg/kg, nickel at 8.5 mg/kg, selenium at 8.5 mg/kg, and zinc at 3,610 mg/kg.

6.3.2 Waste Rock Pile

Waste rock at the mine site was cast down slope at the adit entrance (Photos 11 and 12, Appendix A). The pile covers a ground surface area of approximately 9,600 square feet and has an estimated average thickness of 8 feet. These dimensions correspond to an estimated volume of 2,800 cubic yards. Eleven locations on the waste rock pile were screened for metals using an XRF spectrometer. The screened locations were limited to the upper one-third of the pile due to the steep slope on the remainder of the pile. A single soil sample was collected based on the screening (MS001). The sample was analyzed for TAL metals.

Sample results are provided in Table 6-3. A total of 21 metals were detected in the sample. Eight metals were detected at concentrations significantly above background including antimony at 33.9 mg/kg, arsenic at 345 mg/kg, cadmium at 1.2 mg/kg, copper at 197 mg/kg, lead at 3,870 mg/kg, mercury at 5.3 mg/kg, silver at 1.4 mg/kg, and zinc at 730 mg/kg.

**Table 6-1—Results Summary for Source (Adit) Surface Water Samples
Musick Mine PA/SI
Lane County, Oregon**

Description	ODEQ Level II Screening Levels for Fresh Surface Water ^{1,2}	Background Surface Water	Adit Surface Water	
Weston Sta. Number		BK002	MS002	MS004
EPA Number		04424073	04424065	04424069
CLP Numbers		MJ47X0	MJ47W2	MJ47W6
Location		Unnamed Tributary to Martin creek	Lower Music Mine Adit	Upper Music Mine Adit No. 1
Metals (ug/L)				
Aluminum	87	236	210	2290
Antimony	1600	60.0 U	60.0 U	60.0 U
Arsenic	150	10.0 U	10.0 U	24.3
Barium	4	27.7 U	31.4 J	6.3 U
Beryllium	5.3	5.0 U	5.0 U	0.26 U
Cadmium	2.2	5.0 U	5.0 U	48.5
Calcium	116000	9540	40300	13700
Chromium	74	0.55 BJK	10.0 U	1.9 BJK
Cobalt	23	50.0 U	50.0 U	8.4 BJK
Copper	9	25.0 U	25.0 U	650
Iron	1000	26.3 BJK	443	4230
Lead	2.5	10.0 U	10.0 U	544
Magnesium	82000	1940 BJK	6190	3460 BJK
Manganese	120	1.5 U	351	674
Mercury	0.77	0.20 U	0.20 U	0.20 U
Nickel	52	40.0 U	40.0 U	6.3 BJK
Potassium	53000	971 BJK	659 BJK	431 BJK
Selenium	5	35.0 U	35.0 U	35.0 U
Silver	0.12	10.0 U	10.0 U	10.0 U
Sodium	680000	4970 BJK	4280 BJK	1690 BJK
Thallium	40	25.0 U	25.0 U	25.0 U
Vanadium	20	50.0 U	50.0 U	50.0 U
Zinc	120	12.3 BJK SQL= 60	175	9010
pH Field Measurements				
pH by Paper	6.5-8.5 ³	6.5	NM	4.5
pH by Meter		6.9	7.58	3.2

Notes:

¹ Aquatic species, provided in Table 1 of Oregon Department of Environmental Quality (ODEQ) document *Guidance for Ecological Risk Assessment*.

² Screening levels for contaminants that bioaccumulate are in the process of being reviewed by ODEQ and may be revised in the future.

³ pH criteria for fresh water, Oregon Administrative Rules 340-41-0021.

Bold type indicates the sample concentration is above the SQL.

Bold underlined type indicates a sample concentration that is significantly above background as defined in Section 5.

BJ: The analyte was positively identified between the MDL and SQL. The associated numerical result is an estimate because the concentration is below the SQL.

CLP: Contract Laboratory Program.

K: Unknown bias.

NM: Not measured.

SQL: Sample Quantitation Limit.

U: The analyte was analyzed but not detected. The associated numerical value is the SQL.

ug/L: Micrograms per liter.

**Table 6-2—Results Summary for Source (Adit) Sediment Samples
Musick Mine PA/SI
Lane County, Oregon**

Description		Background Sediment	Adit Sediment
Weston Sta. Number		BK002	MS002
EPA Number		04424074	04424066
CLP Numbers		(M)J47X1	MJ47W3
	ODEQ Level II	Unnamed	
	Screening Levels for	Tributary to	
	Freshwater	Martin creek	
Location	Sediment ^{1,2}		Lower Music Mine Adit
Metals (mg/kg)			
Aluminum	NA	8350	7030
Antimony	3	0.65 UJK	<u>25.9</u> JL
Arsenic	6	20.5	<u>184</u>
Barium	NA	140	261
Beryllium	NA	0.65 JK	0.58 BJK
Cadmium	0.6	0.19 U	<u>3.4</u>
Calcium	NA	1610	2040
Chromium	37	4.2	0.93 BJK
Cobalt	NA	5.8 BJK SQL= 6.0	<u>16.6</u>
Copper	36	7.3	15.6
Iron	NA	25900	29900
Lead	35	9.4 JL	<u>70.9</u> JL
Magnesium	NA	1640 JK	646 BJK
Manganese	1100	824	<u>16100</u>
Mercury	0.2	0.040 BJK SQL= 0.12	<u>0.40</u>
Nickel	18	2.8 BJK SQL= 4.8	<u>8.5</u>
Potassium	NA	833	802 BJK
Selenium	NA	0.90 U	<u>8.5</u>
Silver	4.5	1.2 U	1.7 U
Sodium	NA	97.4 BJK	862 U
Thallium	NA	3.0 U	1.6 BJK
Vanadium	NA	20.9	5.9 BJK
Zinc	123	40.0	<u>3610</u>

Notes:

¹ Provided in Table 2 of Oregon Department of Environmental Quality (ODEQ) document *Guidance for Ecological Risk Assessment*.

² Screening levels for contaminants that bioaccumulate are in the process of being reviewed by ODEQ and may be revised in the future.

Bold type indicates the sample concentration is above the SQL.

Bold underlined type indicates a sample concentration that is significantly above background as defined in Section 5.

BJ: The analyte was positively identified between the MDL and SQL. The associated numerical result is an estimate because the concentration is below the SQL.

CLP: Contract Laboratory Program.

J: The analyte was positively identified. The associated numerical result is an estimate.

K: Unknown bias.

L: Low bias.

mg/kg: Milligrams per kilogram.

NA: Not Available.

SQL: Sample Quantitation Limit.

U: The analyte was analyzed for but not detected. The associated numerical value is the SQL.

SECTION 7

MIGRATION/EXPOSURE PATHWAYS AND TARGETS

Site streams located within the potential contaminant overland flow pathway were sampled to assess contaminant migration. Attribution samples from streams located downgradient of other mine areas were also sampled. Sampling activities and results for the target samples collected are described below. Also described are the physical settings and potential receptors for each of the exposure pathways. Target sampling locations are shown on Figures 3-1 through 3-3.

7.1 GROUNDWATER MIGRATION PATHWAY

7.1.1 Physical Setting

The Musick Mine site is located within the Umpqua National Forest along the Calapooya Divide within the Calapooya Mountains of Oregon. The main mine workings are located on the eastern and western slopes of the Bohemia Saddle between Bohemia Mountain and Fairview Peak. The Calapooya divide is rugged, with steep, narrow valleys, and peaks of 5,900 feet above msl. Bedrock Geology at the site consists of Miocene and Oligocene sedimentary and volcanoclastic rocks (PSU 2004, USGS 2000). Depth to groundwater near the site is unknown; no records of a groundwater study in the area were identified. Based on the thin surficial soil and subsurface geology in the area, Weston assumed a hydraulic conductivity of 10^{-5} centimeter per second for site aquifers. Mean annual precipitation in the site vicinity is 55.3 inches, recorded at the Disston, Oregon station, located approximately 12 miles northwest of the mine (WRCC 2003).

7.1.2 Targets

According to the Oregon Water Resource Department, there are no groundwater wells located within the site's 4-mile TDL, presented in Figure 7-1 (OWRD 2003). Since no wells were identified, there is no groundwater population, groundwater within the TDL is not used for irrigation and livestock watering, and no wellhead protection areas are present.

7.2 SURFACE WATER MIGRATION PATHWAY

7.2.1 Physical Setting

The Upper Musick Mine and Lower Musick Mine have separate surface water drainage pathways. The Upper Musick Mine is located on the eastern side of the Bohemia saddle and drains eastward into the headwaters of City Creek. There are two surface water flow pathways draining separate source areas at Upper Musick Mine and two PPEs are located on City Creek (Figure 3-1). The Lower Musick Mine is located on the western side of the Bohemia saddle and drains westward into Glenwood Creek. A single surface water overland flow pathway exists at the Lower Musick Mine that flows to a single PPE on Glenwood Creek (Figure 3-2).

The Musick Mine site is located within the boundaries of the Umpqua National Forest. Surface soil type in the vicinity of the Musick Mine has not been investigated or mapped by the Natural Resource Conservation Service or the USFS. Surface soils observed during the site visit consisted of a thin (less than 6 inches thick) layer of silty sand with gravel and occasional organic material overlying bedrock. The 2-year, 24-hour rainfall at the site vicinity is 4.67 inches recorded at the Disston, Oregon station, located approximately 12 miles northwest of the mine (WRCC 2003). The estimated upland drainage area for the site is approximately 40 acres on the east slope of the Bohemia saddle and 20 acres on the west slope. The mine is not located in a floodplain (FEMA 2003).

The 15-mile TDL for Upper Musick Mine begins at the PPEs into City Creek (Figure 3-3). City Creek flows approximately 7 miles to the confluence with Steamboat Creek. The 15-mile TDL continues 8 miles along Steamboat Creek (Figure 7-2). The flow rate for City Creek has been recorded as 0.71 cubic feet per second (cfs) during September. Flow rates in the 2002 water year for Steamboat Creek have been reported to range from 28 cfs to 12,700 cfs with an annual mean of 664 cfs (USGS 2003). Based on the flow rates, City Creek is considered a minimal stream and the Steamboat Creek is considered a large stream to river.

The 15-mile TDL for the Lower Musick Mine begins at the PPE into Glenwood Creek and extends approximately 1¼ miles west to the confluence with Bohemia Creek. The 15-mile TDL continues approximately ½ mile along Bohemia Creek to its confluence with the Sharps Creek and an additional 13 ¼ miles along the Sharps Creek to the end of the 15 mile TDL (Figure 7-2). The flow rate for Glenwood Creek and Bohemia Creek are estimated to be less than 10 cfs. The flow rate for Sharps Creek is estimated to range between 100 cfs to 1,000 cfs. Based on their flow rates, Glenwood and Bohemia Creek are considered minimal streams and Sharps Creek is considered a moderate to large stream.

7.2.2 Pathway Samples and Analytical Results

7.2.2.1 Upper Musick Mine

City Creek was assessed for the presence of contaminants migrating from the mine site by the collection of one sediment sample at each of the two PPEs identified in the creek (ST003 and ST004). Photo 13 (Appendix A) shows City Creek at PPE 2. A third sediment sample (and co-located surface water sample) was collected approximately 6 miles downstream at the confluence with Steamboat Creek to assess the possible distribution of contaminants (ST001). Attribution surface water and sediment samples were collected from Steamboat Creek upstream of the confluence (ST002) and from a tributary stream draining the Champion mine area (ST006). A surface water and sediment sample (ST005) were collected from Alpharetta Creek at the mine property boundary to assess potential impacts from unknown activities occurring in the eastern half of the mine site. No significant evidence of mine workings were observed in this area of the site during the PA/SI fieldwork. All surface water and sediment samples were analyzed for TAL metals. In addition, the sediment sample from PPE number 1 (ST003) was analyzed for PCBs to assess possible contaminant migration from the stamp mill area. All surface water samples were measured for pH.

Analytical results for surface water samples are presented in Table 7-1. Several common earth crust elements were detected in the samples. The only additional metals detected are manganese and zinc at low levels. No metals were detected at concentrations elevated above background. Measured pH levels ranged from 5.7 to 6.6.

Analytical results for sediment samples are presented in Table 7-2. A total of 22 metals were detected in the samples. Metals detected at concentrations elevated above background consist of antimony at 5.1 to 12.4 mg/kg, arsenic at 90.8 mg/kg, cadmium at 0.66 to 3.9 mg/kg, cobalt at 7.4 to 20.5 mg/kg, copper at 23.6 to 536 mg/kg, lead at 49.9 to 2,760 mg/kg, manganese at 2,730 mg/kg, mercury at 0.26 to 1.7 mg/kg, nickel at 6.2 and 15.6 mg/kg, silver at 1.7 mg/kg, and zinc at 132 to 787 mg/kg.

7.2.2.2 Lower Musick Mine

Glenwood Creek was assessed for the presence of contaminants migrating from the mine site by the collection of surface water and sediment samples from the PPE (ST002) and from a location situated approximately 1/2 miles downstream of the PPE (ST001; Photo 14, Appendix A). Attribution surface water and sediment samples (ST003) were collected from Glenwood Creek at a location upstream of the PPE. All surface water and sediment samples were analyzed for TAL metals. All surface water samples were measured for pH.

Analytical results for surface water samples are presented in Table 7-3. Detected metals include several common earth crust elements, chromium, manganese, and zinc. No metals were detected at concentrations elevated above background. Measured pH ranged from 6.5 to 7.7.

Analytical results for sediment samples are presented in Table 7-4. Of the 20 metals detected in the samples, metals detected at concentrations elevated above background consist of antimony at 2.4 and 3.9 mg/kg, arsenic at 67.6 mg/kg, cadmium at 0.77 and 0.92 mg/kg, chromium at 15 mg/kg, cobalt at 8.2 and 11.7 mg/kg, copper at 29 mg/kg, lead at 39.1 and 55.4 mg/kg, mercury at 0.13 to 0.99 mg/kg, nickel at 4.9 to 11.3 mg/kg, and zinc at 202 and 236 mg/kg.

7.2.3 Targets

There are no surface water intakes located along the 15-mile TDL for the Upper or Lower Musick Mine (OWRD 2003). Since there are no intakes, neither surface water 15-mile TDL is currently used to irrigate commercial food crops, water commercial livestock, in commercial food preparation, or to supply a major designated water recreation area. Within the Upper Musick Mine TDL, City Creek and Steamboat Creek are closed to angling and not used for recreational or commercial fishing (ODFW 2004). Cutthroat trout and steelhead salmon utilize Steamboat Creek and City Creek for rearing and spawning habitat. Within the Lower Musick Mine TDL, Glenwood, Bohemia, and Sharps Creeks are open to angling but no fish catch data is available for these creeks. Resident cutthroat trout utilize Glenwood, Bohemia, and Sharps Creeks for rearing and spawning habitat. No threatened or endangered aquatic species have been identified within the 15-mile TDL for either mine site (ONHIC 2004). Wetland frontage along the Lower Musick Mine 15-mile TDL consists of approximately 1/4 mile of wetland frontage

along Sharps Creek (USFWS 1995, 1993a-f). Wetland frontage along the Upper Musick Mine 15-mile TDL consists of approximately 1 mile of wetland frontage along Steamboat Creek.

7.3 SOIL EXPOSURE PATHWAY

7.3.1 Physical Setting

As previously described in Section 7.2.1, surface soils in the potential source areas generally consist of silty sand with gravel. The majority of source area soils are unvegetated and directly accessible to terrestrial receptors. Site access is restricted but occasional trespassing by recreational users occurs.

7.3.2 Targets

There are no residences or workers known to be located on the Musick Mine site or within 200 feet of potential sources of contamination. No schools or daycare facilities are located on the Mine site. There is no recorded resident population within 1 mile of the site (EPA 2003b). Both mine areas are located in designated critical habitat for the federal- and state- listed threatened species the northern spotted owl (*Strix occidentalis caurina*, ONHIC 2004). No commercial agriculture, commercial livestock production or grazing occur onsite.

7.4 AIR MIGRATION PATHWAY

7.4.1 Physical Setting

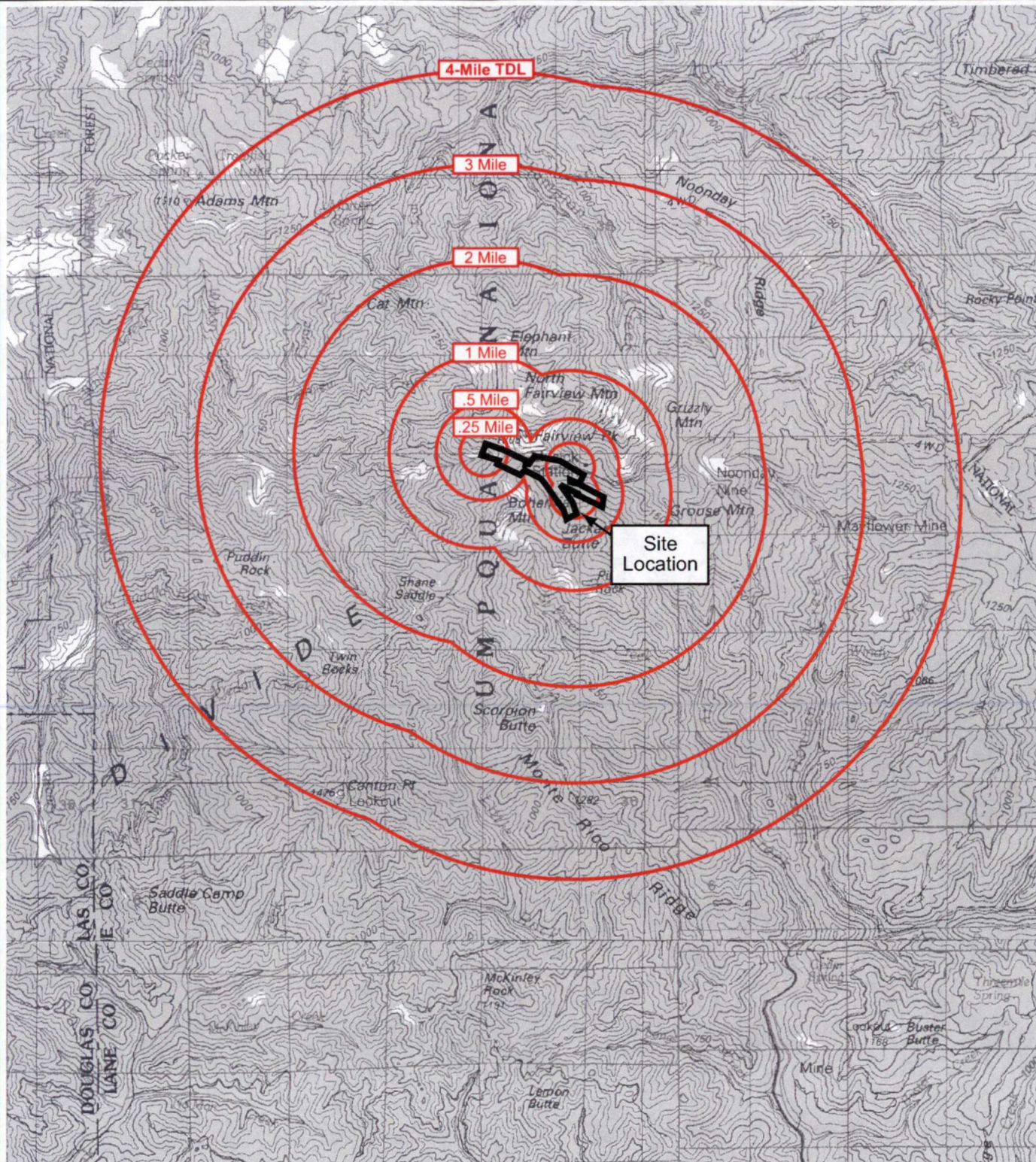
No known releases to air have occurred at the site. Potential releases could occur by particulate migration if the uncontained source area soils are transported during windy periods.

7.4.2 Targets

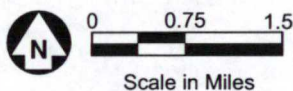
There is no documented residential population within the pathway's 4-mile TDL. Based on National Wetland Inventory maps, Weston estimates that approximately 19 acres of wetlands occurs within the pathway's 4-mile TDL (USFWS 1995, 1993a-f). Table 7-5 summarizes the wetland acreage distribution. Two sensitive environments are present within the 4-mile TDL (ONHIC 2004) as described below.

- The American peregrine falcon (*Falco peregrinus anatum*), a state-listed endangered species, has been observed within the 4-mile TDL.
- The presence of the northern spotted owl (*Strix occidentalis caurina*), a federal-and state-listed threatened species, has been documented within the 4-mile TDL. In addition, lands within the 4-mile TDL have been designated critical habitat for the species (USFS 2004).

No commercial agriculture was identified within 1/2 mile of the site. The site is located within the Umpqua National forest, a designated recreation area that is also used for silviculture.

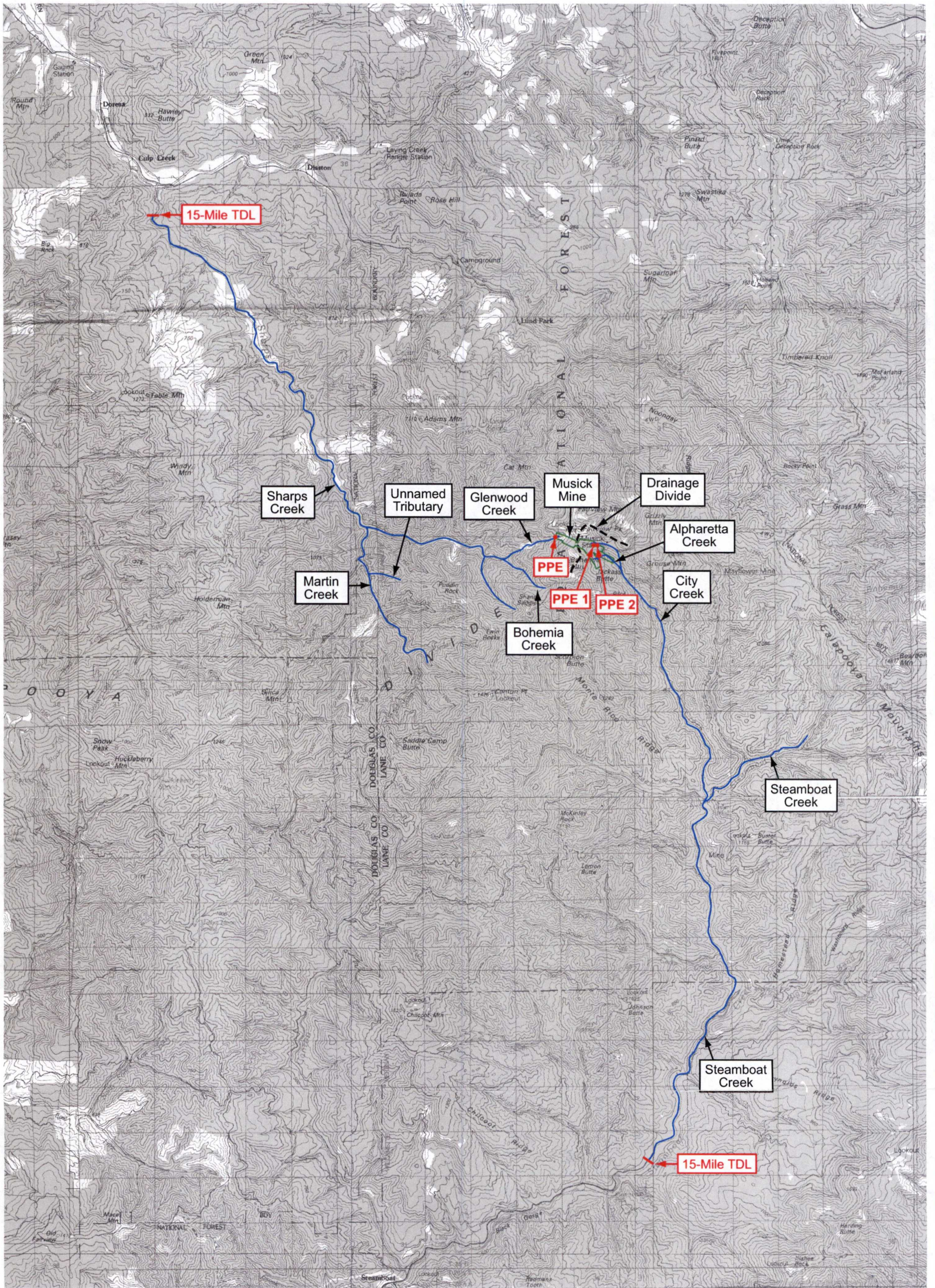


Source: USGS 1:100,000 Scale Series Topo, Diamond Lake-OR, 1978 and Oakridge-OR, 1983.



4-Mile Target Distance Limit (TDL) Map Musick Mine PA/SI Lane County, Oregon

Figure
7-1



Source: USGS 1:100,000 Scale Series Topo, Diamond Lake-OR, 1978 and Oakridge-OR, 1983.



- Property Boundary
- Probable Point of Entry (PPE)
- Surface Water

15-Mile Target Distance Limit (TDL) Map Musick Mine PA/SI Lane County, Oregon

Figure
7-2

**Table 7-1—Results Summary for Upper Musick Mine Stream Surface Water Samples
Musick Mine PA/SI
Lane County, Oregon**

Description	ODEQ Level II Screening Levels for Fresh Surface Water ^{1,2}	Background Surface Water	Upper Musick Mine Stream Surface Water					
Weston Sta. Number		BK002	ST001	ST002	ST003	ST004	ST005	ST006
EPA Number		04424073	04424054	04424056	NA	NA	04424070	04424075
CLP Numbers		MJ47X0	MJ47T1	MJ47T3	NA	NA	MJ47W7	MJ47X2
Location		Unnamed Tributary to Martin Creek	City Ck. and Steamboat Ck. Confluence	Steamboat Ck. Attribution	PPE to City Ck. From Adit No. 1	PPE to City Ck. From Adit No. 2	Alpharetta Ck. at Property Boundary	Champion Mine Attribution
Metals (ug/L)								
Aluminum	87	236	243 U	255	-	-	207 U	246
Antimony	1600	60.0 U	60.0 U	60.0 U	-	-	60.0 U	60.0 U
Arsenic	150	10.0 U	10.0 U	10.0 U	-	-	10.0 U	10.0 U
Barium	4	27.7 U	6.7 U	6.4 U	-	-	11.2 U	13.4 U
Beryllium	5.3	5.0 U	5.0 U	5.0 U	-	-	5.0 U	5.0 U
Cadmium	2.2	5.0 U	5.0 U	5.0 U	-	-	5.0 U	5.0 U
Calcium	116000	9540	6000	12000	-	-	2940 BJK	2890 BJK
Chromium	74	0.55 BJK	10.0 U	10.0 U	-	-	10.0 U	10.0 U
Cobalt	23	50.0 U	50.0 U	50.0 U	-	-	50.0 U	50.0 U
Copper	9	25.0 U	25.0 U	25.0 U	-	-	25.0 U	3.5 U
Iron	1000	26.3 BJK	100 U	100 U	-	-	100 U	100 U
Lead	2.5	10.0 U	10.0 U	10.0 U	-	-	10.0 U	10.0 U
Magnesium	82000	1940 BJK	1130 BJK	2210 BJK	-	-	414 BJK	498 BJK
Manganese	120	1.5 U	15.0 U	8.5 BJK	-	-	15.0 U	15.0 U
Mercury	0.77	0.20 U	0.20 U	0.20 U	-	-	0.20 U	0.20 U
Nickel	52	40.0 U	40.0 U	40.0 U	-	-	40.0 U	40.0 U
Potassium	53000	971 BJK	540 BJK	629 BJK	-	-	253 BJK	382 BJK
Selenium	5	35.0 U	35.0 U	35.0 U	-	-	35.0 U	35.0 U
Silver	0.12	10.0 U	10.0 U	10.0 U	-	-	10.0 U	10.0 U
Sodium	680000	4970 BJK	3330 BJK	4820 BJK	-	-	1690 BJK	2380 BJK
Thallium	40	25.0 U	25.0 U	25.0 U	-	-	25.0 U	25.0 U
Vanadium	20	50.0 U	50.0 U	50.0 U	-	-	50.0 U	50.0 U
Zinc	120	12.3 BJK	4.1 U	5.2 U	-	-	5.9 U	5.4 BJK

**Table 7-1—Results Summary for Upper Musick Mine Stream Surface Water Samples
Musick Mine PA/SI
Lane County, Oregon**

Description	ODEQ Level II Screening Levels for Fresh Surface Water ^{1, 2}	Background Surface Water	Upper Musick Mine Stream Surface Water					
Weston Sta. Number		BK002	ST001	ST002	ST003	ST004	ST005	ST006
EPA Number		04424073	04424054	04424056	NA	NA	04424070	04424075
CLP Numbers		MJ47X0	MJ47T1	MJ47T3	NA	NA	MJ47W7	MJ47X2
Location		Unnamed Tributary to Martin Creek	City Ck. and Steamboat Ck. Confluence	Steamboat Ck. Attribution	PPE to City Ck. From Adit No. 1	PPE to City Ck. From Adit No. 2	Alpharetta Ck. at Property Boundary	Champion Mine Attribution
pH Field Measurements								
pH by Paper	6.5-8.5 ³	6.5	NM	NM	5.3	5.5	5.5	6.5
pH by Meter		6.9	6.6	6.6	5.7	6.0	5.9	6.34

Notes:

¹ Aquatic species, provided in Table 1 of Oregon Department of Environmental Quality (ODEQ) document *Guidance for Ecological Risk Assessment*.

² Screening levels for contaminants that bioaccumulate are in the process of being reviewed by ODEQ and may be revised in the future.

³ pH criteria for fresh water, Oregon Administrative Rules 340-41-0021.

- Analysis not conducted.

Bold type indicates the sample concentration is above the SQL.

BJ: The analyte was positively identified between the MDL and SQL. The associated numerical result is an estimate because the concentration is below the SQL.

CLP: Contract Laboratory Program.

K: Unknown bias.

NM: Not measured.

SQL: Sample Quantitation Limit.

U: The analyte was analyzed for but not detected. The associated numerical value is the SQL.

ug/L: Micrograms per liter.

Table 7-2—Results Summary for Upper Musick Mine Sediment Samples
Musick Mine PA/SI
Lane County, Oregon

Description	ODEQ Level II Screening Levels for Freshwater Sediment ^{1, 2}	Background Sediment	Upper Musick Mine Sediment					
Weston Sta. Number		BK002	ST001	ST002	ST003	ST004	ST005	ST006
EPA Number		04424074	04424055	04424057	04424067	04424068	04424071	04424076
CLP Numbers		(M)J47X1	MJ47T2	MJ47T4	(M)J47W4	(M)J47W5	MJ47W8	MJ47X3
Location		Unnamed Tributary to Martin Creek	City Ck. and Steamboat Ck. Confluence	Steamboat Ck. Attribution	PPE to City Ck. From Adit No. 1	PPE to City Ck. From Adit No. 2	Alpharetta Ck. at Property Boundary	Evening Star Mine Attribution
Metals (mg/kg)								
Aluminum	NA	8350	13700	16100	8970	7150	9600	13200
Antimony	3	0.65 UJK	0.99 UJK	9.1 UJK	<u>5.1</u> BJK	<u>8.5</u> JL	<u>3.8</u> BJK	<u>12.4</u> JL
Arsenic	6	<u>20.5</u>	<u>7.9</u>	<u>9.1</u>	<u>51.8</u>	<u>77.2</u>	<u>47.9</u>	<u>90.8</u>
Barium	NA	<u>140</u>	<u>131</u>	<u>131</u>	<u>30.8</u>	21.1 BJK	<u>70.5</u>	<u>81.2</u>
Beryllium	NA	0.65 JK	0.29 BJK	0.39 BJK	0.49 BJK	0.39 BJK	0.38 BJK	0.56 JK
Cadmium	0.6	0.19 UJ	<u>1.1</u>	0.66 BJK	<u>3.8</u>	<u>3.9</u>	<u>0.82</u>	<u>3.2</u>
Calcium	NA	<u>1610</u>	<u>3360</u>	<u>5480</u>	609 BJK	491 BJK	<u>1100</u>	<u>1270</u>
Chromium	37	<u>4.2</u>	<u>6.1</u>	<u>10.6</u>	<u>3.8</u>	<u>4.0</u>	<u>6.4</u>	<u>12.1</u>
Cobalt	NA	5.8 BJK SQL= 6.0	<u>12.8</u>	<u>14.8</u>	<u>20.5</u>	<u>9.9</u>	<u>7.4</u>	<u>13.3</u>
Copper	36	<u>7.3</u>	<u>19.7</u>	<u>23.6</u>	<u>536</u>	<u>445</u>	<u>15.7</u>	<u>206</u>
Iron	NA	<u>25900</u>	<u>24900</u>	<u>28400</u>	<u>20300</u>	<u>22600</u>	<u>23000</u>	<u>25600</u>
Lead	35	<u>9.4</u> JL	<u>49.9</u> JL	<u>11.8</u> JL	<u>2760</u> JL	<u>1640</u> JL	<u>150</u> JL	<u>590</u> JL
Magnesium	NA	<u>1640</u> JK	<u>5350</u> JK	<u>6070</u> JK	<u>2620</u> JK	<u>2160</u> JK	<u>3430</u> JK	<u>5090</u> JK
Manganese	1100	<u>824</u>	<u>802</u>	<u>672</u>	<u>2730</u>	<u>1020</u>	<u>930</u>	<u>740</u>
Mercury	0.2	0.040 BJK SQL= 0.12	<u>1.7</u>	0.020 BJK	<u>1.3</u>	<u>0.62</u>	<u>0.26</u>	<u>1.4</u>
Nickel	18	2.8 BJK SQL= 4.8	4.3 BJK	<u>15.6</u>	3.8 BJK	2.7 BJK	5.0 BJK	<u>6.2</u>
Potassium	NA	<u>833</u>	<u>624</u>	707 BJK	481 BJK	437 BJK	563 BJK	456 BJK
Selenium	NA	0.90 U	3.9 U	5.3 U	1.3 U	1.5 U	0.83 U	1.5 U
Silver	4.5	1.2 U	1.1 U	1.5 U	0.27 BJK	0.57 BJK	1.4 U	<u>1.7</u>
Sodium	NA	97.4 BJK	110 BJK	406 BJK	644 U	617 U	64.6 BJK	557 U
Thallium	NA	3.0 U	2.8 U	3.8 U	3.2 U	1.5 BJK	1.6 BJK	2.8 U
Vanadium	NA	<u>20.9</u>	<u>34.5</u>	<u>48.8</u>	<u>21.4</u>	<u>17.2</u>	<u>18.9</u>	<u>32.1</u>
Zinc	123	<u>40.0</u>	<u>222</u>	<u>132</u>	<u>787</u>	<u>709</u>	<u>234</u>	<u>538</u>

**Table 7-2—Results Summary for Upper Musick Mine Sediment Samples
Musick Mine PA/SI
Lane County, Oregon**

Description	ODEQ Level II Screening Levels for Freshwater Sediment ^{1, 2}	Background Sediment	Upper Musick Mine Sediment					
Weston Sta. Number		BK002	ST001	ST002	ST003	ST004	ST005	ST006
EPA Number		04424074	04424055	04424057	04424067	04424068	04424071	04424076
CLP Numbers		(M)J47X1	MJ47T2	MJ47T4	(M)J47W4	(M)J47W5	MJ47W8	MJ47X3
Location		Unnamed Tributary to Martin Creek	City Ck. and Steamboat Ck. Confluence	Steamboat Ck. Attribution	PPE to City Ck. From Adit No. 1	PPE to City Ck. From Adit No. 2	Alpharetta Ck. at Property Boundary	Evening Star Mine Attribution
PCBs (mg/kg)								
All Analytes		ND	-	-	ND	-	-	-

Notes:

¹ Provided in Table 2 of Oregon Department of Environmental Quality (ODEQ) document *Guidance for Ecological Risk Assessment*.

² Screening levels for contaminants that bioaccumulate are in the process of being reviewed by ODEQ and may be revised in the future.

- Not analyzed.

Bold type indicates the sample concentration is above the SQL.

Bold underlined type indicates a sample concentration that is significantly above background as defined in Section 5.

BJ: The analyte was positively identified between the MDL and SQL. The associated numerical result is an estimate because the concentration is below the SQL.

CLP: Contract Laboratory Program.

J: The analyte was positively identified. The associated numerical result is an estimate.

K: Unknown bias.

L: Low bias.

mg/kg: Milligrams per kilogram.

NA: Not Available.

PCBs: Polychlorinated biphenyls.

SQL: Sample Quantitation Limit.

U: The analyte was analyzed for but not detected. The associated numerical value is the SQL.

**Table 7-3—Results Summary for Lower Music Mine Stream Surface Water Samples
Musick Mine PA/SI
Lane County, Oregon**

Description	ODEQ Level II Screening Levels for Fresh Surface Water ^{1, 2}	Background Surface Water	Lower Music Mine Stream Surface Water		
Weston Sta. Number		BK002	ST001	ST002	ST003
EPA Number		04424073	04424058	04424061	04424063
CLP Numbers		MJ47X0	MJ47T5	MJ47T8	MJ47W0
Location		Unnamed Tributary to Martin creek	Glenwood Ck.	Glenwood Ck. PPE	Wildhog Mine Attribution
Metals (ug/L)					
Aluminum	87	236	224	220	273
Antimony	1600	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic	150	10.0 U	10.0 U	10.0 U	10.0 U
Barium	4	27.7 U	11.9 U	13.3 U	14.6 U
Beryllium	5.3	5.0 U	5.0 U	5.0 U	5.0 U
Cadmium	2.2	5.0 U	0.26 U	5.0 U	5.0 U
Calcium	116000	9540	15400	17700	19300
Chromium	74	0.55 BJK	10.0 U	0.50 BJK	10.0 U
Cobalt	23	50.0 U	50.0 U	50.0 U	50.0 U
Copper	9	25.0 U	25.0 U	25.0 U	25.0 U
Iron	1000	26.3 BJK	100 U	100 U	60.6 BJK
Lead	2.5	10.0 U	10.0 U	10.0 U	10.0 U
Magnesium	82000	1940 BJK	2340 BJK	2370 BJK	2450 BJK
Manganese	120	1.5 U	1.3 BJK	1.8 J	9.1 BJK
Mercury	0.77	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	52	40.0 U	40.0 U	40.0 U	40.0 U
Potassium	53000	971 BJK	509 BJK	535 BJK	622 BJK
Selenium	5	35.0 U	35.0 U	35.0 U	35.0 U
Silver	0.12	10.0 U	10.0 U	10.0 U	10.0 U
Sodium	680000	4970 BJK	3170 BJK	3330 BJK	3350 BJK
Thallium	40	25.0 U	25.0 U	25.0 U	25.0 U
Vanadium	20	50.0 U	50.0 U	50.0 U	50.0 U
Zinc	120	12.3 BJK	6.1 BJK	6.6 BJK	7.7 BJK
pH Field Measurements					
pH by Paper	6.5-8.5 ³	6.5	NM	6.5	NM
pH by Meter		6.9	6.5	7.6	7.7

Notes:

¹ Aquatic species, provided in Table 1 of Oregon Department of Environmental Quality (ODEQ) document *Guidance for Ecological Risk Assessment*.

² Screening levels for contaminants that bioaccumulate are in the process of being reviewed by ODEQ and may be revised in the future.

³ pH criteria for fresh water, Oregon Administrative Rules 340-41-0021.

Bold type indicates the sample concentration is above the SQL.

BJ: The analyte was positively identified between the MDL and SQL. The associated numerical result is an estimate because the concentration is below the SQL.

CLP: Contract Laboratory Program.

K: Unknown bias.

NM: Not measured.

SQL: Sample Quantitation Limit.

U: The analyte was analyzed for but not detected. The associated numerical value is the SQL.

ug/L: Micrograms per liter.

**Table 7-4—Results Summary for Lower Musick Mine Stream Sediment Samples
Musick Mine PA/SI
Lane County, Oregon**

Description	ODEQ Level II Screening Levels for Freshwater Sediment ^{1, 2}	Background Sediment	Lower Music Mine Sediment		
Weston Sta. Number		BK002	ST001	ST002	ST003
EPA Number		04424074	04424059	04424062	04424064
CLP Numbers		(M)J47X1	MJ47T6	MJ47T9	MJ47W1
Location		Unnamed Tributary to Martin creek	Glenwood Ck. Downstream Location	PPE to Glenwood Ck.	Wildhog Mine Attribution
Metals (mg/kg)					
Aluminum	NA	8350	10500	8810	12100
Antimony	3	0.65 UJK	0.63 UJK	2.4 BJK	3.9 BJK
Arsenic	6	20.5	11.7	33.0	<u>67.6</u>
Barium	NA	140	44.2	54.6	60.1
Beryllium	NA	0.65 JK	0.34 BJK	0.56 BJK	0.52 BJK
Cadmium	0.6	0.19 UJ	0.48 U	<u>0.92</u>	<u>0.77</u>
Calcium	NA	1610	1140	1070	1260
Chromium	37	4.2	5.6	6.0	<u>15.0</u>
Cobalt	NA	5.8 BJK SQL= 6.0	5.7	<u>8.2</u>	<u>11.7</u>
Copper	36	7.3	9.8	13.9	<u>29.0</u>
Iron	NA	25900	20500	22600	29800
Lead	35	9.4 JL	16.3 JL	<u>39.1</u> JL	<u>55.4</u> JL
Magnesium	NA	1640 JK	3410 JK	2560 JK	5510 JK
Manganese	1100	824	598	807	921
Mercury	0.2	0.040 BJK SQL= 0.12	<u>0.13</u>	<u>0.99</u>	<u>0.25</u>
Nickel	18	2.8 BJK SQL= 4.8	<u>4.9</u>	<u>6.0</u>	<u>11.3</u>
Potassium	NA	833	467 BJK	658 BJK	658 BJK
Selenium	NA	0.90 U	0.52 U	5.1 U	1.1 U
Silver	4.5	1.2 U	1.1 U	1.5 U	1.5 U
Sodium	NA	97.4 BJK	82.2 BJK	52.5 BJK	63.8 BJK
Thallium	NA	3.0 U	2.8 U	3.7 U	3.7 U
Vanadium	NA	20.9	19.9	18.4	35.5
Zinc	123	40.0	111	<u>202</u>	<u>236</u>

Notes:

¹ Provided in Table 2 of Oregon Department of Environmental Quality (ODEQ) document *Guidance for Ecological Risk Assessment*.

² Screening levels for contaminants that bioaccumulate are in the process of being reviewed by ODEQ and may be revised in the future.

Bold type indicates the sample concentration is above the SQL.

Bold underlined type indicates a sample concentration that is significantly above background as defined in Section 5.

BJ: The analyte was positively identified between the MDL and SQL. The associated numerical result is an estimate because the concentration is below the SQL.

CLP: Contract Laboratory Program.

J: The analyte was positively identified. The associated numerical result is an estimate.

K: Unknown bias.

L: Low bias.

mg/kg: Milligrams per kilogram.

NA: Not Available.

PCBs: Polychlorinated biphenyls.

SQL: Sample Quantitation Limit.

U: The analyte was analyzed for but not detected. The associated numerical value is the SQL.

SECTION 8

SUMMARY AND CONCLUSIONS

The Musick Mine is a former gold mine that was commercially active between 1891 and 1931. Silver, lead, and zinc ore were reportedly mined in addition to gold. The mine is located in the Bohemia mining district within the Umpqua National Forest in southwestern Oregon. Major features remaining at the mine site consist of several adits, large associated waste rock piles, and a relatively smaller tailings pile. All mine processing equipment used historically, including a former stamp mill, gravity concentrator, and ore bin, has been removed from the site. The site straddles Bohemia saddle, a drainage divide. Mine features located on the eastern side of the saddle (Upper Musick Mine) are drained by City Creek, the headwaters of which originate on the mine site. Mine features located on the western side of the saddle (Lower Musick Mine) are drained by Glenwood Creek. The headwaters of Glenwood Creek originate a short distance upstream of the mine property.

The PA/SI focused on investigating potential source areas at the mine for the presence of COCs and associated surface water drainages for possible impacts from migrating contaminants. Major potential sources such as waste rock and tailings piles were sampled and analyzed for the COCs identified for the site. Streams draining the sites were also sampled and analyzed for COCs in sediment and surface water. The potential COCs consist of heavy metals and PCBs associated with the potential use of electrical equipment at the former 22-ton concentrator mill. All surface waters were also measured for pH as an assessment for AMD.

The source soil, surface water, and sediment samples analyzed contained up to 12 metals at concentrations significantly above background including: lead, cadmium, and mercury, among others (Tables 6-1 through 6-3). Metals concentrations detected in source soils were markedly higher at the Upper Musick Mine compared to Lower Musick Mine. PCBs were not detected in any of the samples collected.

The results of pH measurements indicate that AMD is present in adit surface water at the Upper Musick Mine and that pH in the headwaters of City Creek may be lowered as a result. At the Upper Musick Mine adit number 1, a pH of 3.2 was measured in the surface water flowing from the adit. This value indicates the presence of AMD. For comparison, the pH in the background stream was 6.9. Stream pH values at PPEs 1 and 2 in City Creek were 5.7 and 6.0 respectively. These values indicate that AMD may be lowering pH in City Creek near the mine. Note that pH in City Creek at the confluence with Steamboat Creek, approximately 6 miles downstream of the mine, was 6.6, a value similar to the background measurement. At the Lower Musick Mine adit, the pH of the surface water was 7.58, a result not indicative of AMD. Measurements for pH in Glenwood creek ranged from 6.5 to 7.7.

A total of nine stream surface water samples were collected. No metals were detected at elevated concentrations in the surface water samples.

In the sediment samples collected from the streams draining the mine site, the same metals found in site sources were generally found, only at lesser concentrations. In City Creek and Alpharetta Creek sediments, eight metals were detected at concentrations elevated above background at one or more locations. These eight metals consist of antimony, cadmium, cobalt, copper, lead, manganese, mercury, and zinc. Of these metals, all are attributable to sources at Upper Musick Mine with the exception of manganese. Attribution samples were collected to assess potential impacts to City Creek and Steamboat Creek from off-site mines. Attribution sediment samples contained several of the same metals (at elevated concentrations) found at elevated concentrations in City Creek and Alpharetta Creek. However, since these metals are present in the Upper Musick Mine sources at significant concentrations, they are at least partially attributable to site sources and were not removed from consideration as COCs.

In the Glenwood Creek PPE and downstream location sediments, seven metals were detected at concentrations elevated above background including: antimony, cadmium, cobalt, lead, mercury, nickel, and zinc. All seven metals are attributable to sources at Lower Musick Mine. All seven metals were also detected at elevated concentrations in the upstream attribution sample in Glenwood Creek. However, similar to the Upper Musick Mine, the metals are at least partially attributable to Lower Musick Mine sources and were not removed from consideration as COCs.

For reference, sample analytical results were compared to screening concentrations in the results summary tables. Screening concentrations consist of EPA Region 9 PRGs, ODEQ soil cleanup levels, ODEQ Level II screening levels for soil, fresh surface water, and freshwater sediments, and ODEQ pH criteria for fresh water. In the source soil samples collected, screening concentrations were exceeded for arsenic, lead, and mercury. In the City Creek and Alpharetta Creek sediment samples, screening concentrations were exceeded for antimony, cadmium, copper, lead, manganese, mercury, and zinc. In City Creek and Alpharetta Creek surface water samples, no screening concentrations were exceeded for metals. The pH criteria (minimum 6.5) was exceeded at the two City Creek PPEs and in Alpharetta Creek. In the Glenwood Creek sediment samples, criteria were exceeded for antimony, cadmium, lead, mercury, and zinc. In Glenwood Creek surface water samples, no screening criteria were exceeded for metals or pH.

The primary potential human receptors at the mine sites are occasional trespassing recreational users and recreating site owners. No groundwater wells were located within the 4-mile TDL so no drinking water exposure pathway was identified. Ecological receptors within the environment of the drainage streams and surface soils at the source areas could potentially be impacted, which could provide a secondary impact to humans through the food chain. A limited sport fishery exists in the Glenwood Creek/Sharps Creek drainage within the 15-mile TDL. This fishery provides a potential pathway for contaminants through the consumption of fish.

Federal or state listed endangered or threatened species identified as possessing known habitat within the air migration pathway's 4-mile TDL include the American peregrine falcon (*Falco peregrinus anatum*), a state-listed endangered species, and the northern spotted owl (*Strix occidentalis caurina*), a federal-and state-listed threatened species. In addition, lands within the 4-mile TDL have been designated critical habitat for the spotted owl. No known habitat for federal or state threatened or endangered species exists within the surface water or soil exposure pathways.

SECTION 9

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APPENDIX A

PHOTO LOG

photo 1



View of Upper Musick Mine adit No. 1.

photo 2



View of Upper Musick Mine adit No. 2.

Photolog



Photolog

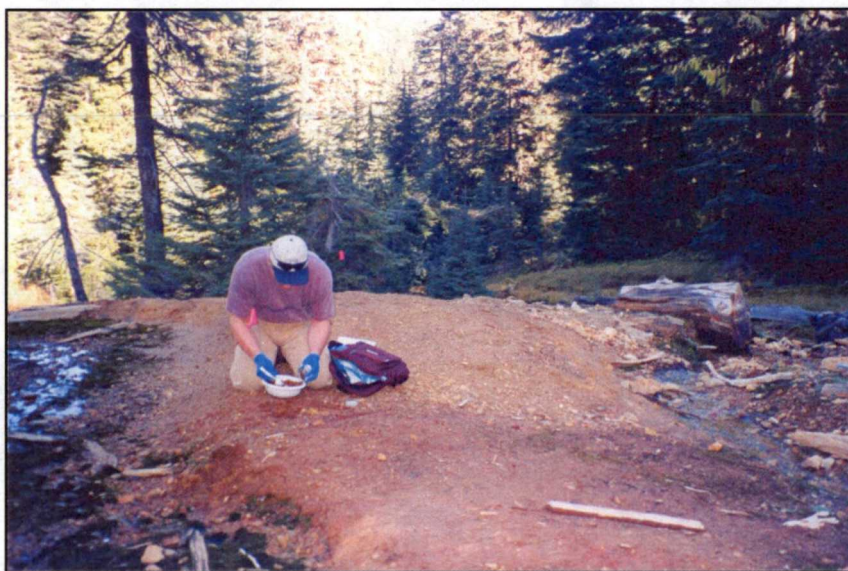
A-1

photo 3



View of Upper Musick Mine. Former location of gravity concentrator (center left) and tailings pile (center right), facing east.

photo 4



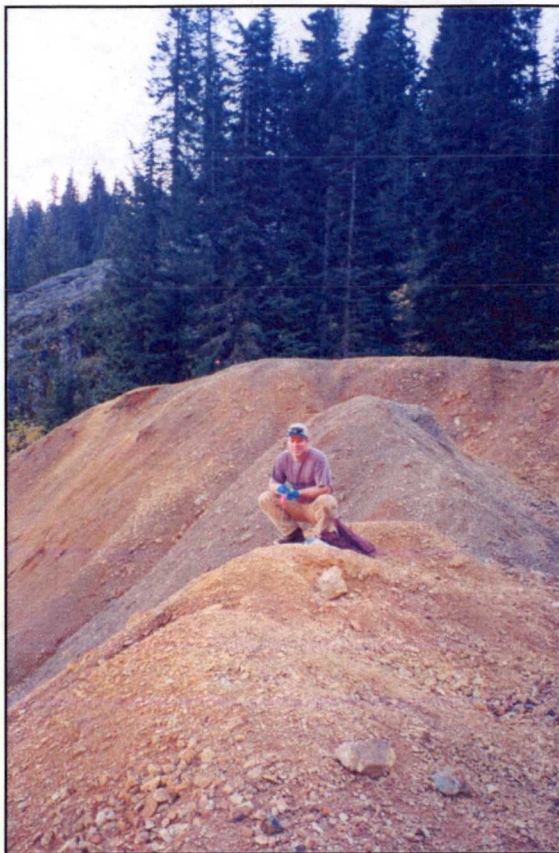
View of sample collection at Upper Musick Mine tailings pile.

Photolog



Photolog
A-2

photo 5



View of Upper Musick Mine waste rock pile No. 1, facing southwest.

photo 6



View of Upper Musick Mine waste rock pile No. 1. View from adit No. 1, facing east. Champion Mine visible in background.

Photolog



photo 7



View of Upper Musick Mine waste rock pile No. 2. View from adit No. 2, facing east.

photo 8



View of Upper Musick Mine waste rock pile No. 2. Sample collection, facing northeast.

Photolog

photo 9



View of Upper Musick Mine stamp mill foundation. Structure to rear is former oil storage tank, facing west.

photo 10



View of Lower Musick Mine adit, facing east.

Photolog

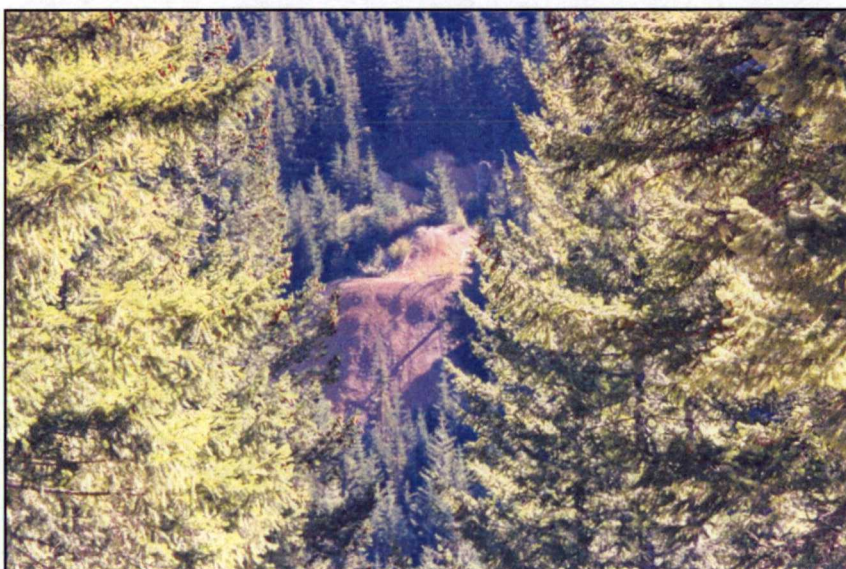


photo 11



View of Lower Musick Mine waste rock pile. View standing on the pile, facing north.

photo 12



View of Lower Musick Mine waste rock pile. View from road on opposite side of valley, facing southeast.

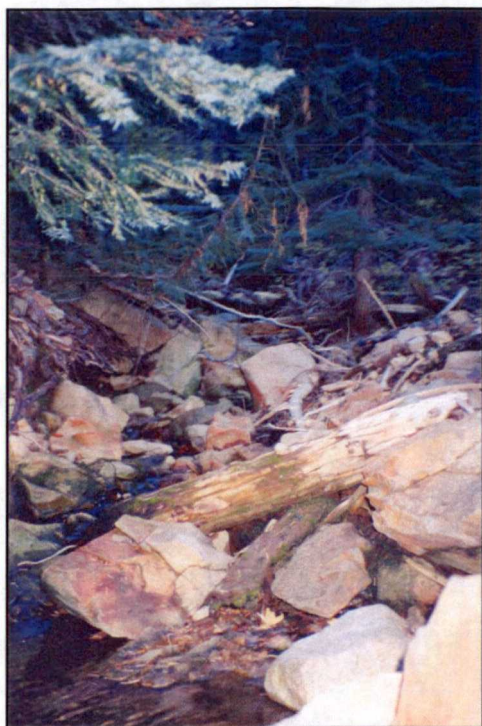
Photolog



Photolog

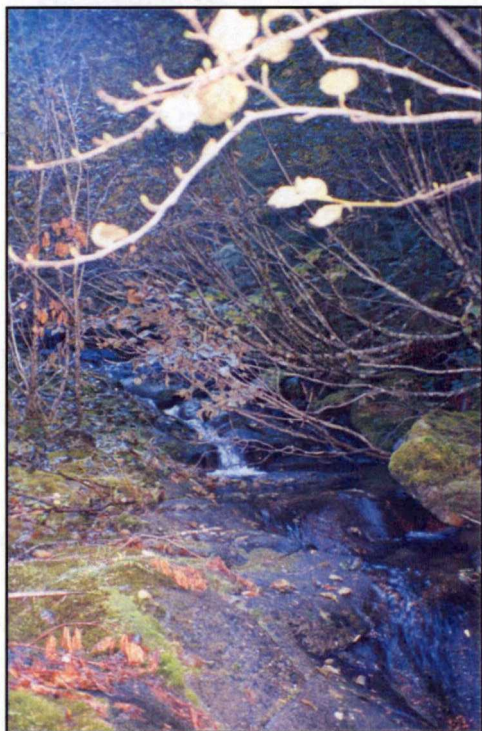
A-6

photo 13



View of Upper Musick Mine. City Creek at PPE No. 2, facing west.

photo 14



View of Lower Musick Mine. Glenwood Creek at downstream sample location ST001, facing northeast.

Photolog

APPENDIX B
SAMPLE PLAN ALTERATION FORMS

SAMPLE PLAN ALTERATION FORM

Project name and number: Musick Mine PA/SI (TDD 03-11-0003-B)

Material to be sampled: Sediment and surface water

Measurement parameter: TAL metals

Planned approach and/or field sampling/laboratory analysis procedures:

Collection of surface water and sediment samples on Glenwood Creek just above confluence with Bohemia Creek. Collection of attribution surface water and sediment samples in Bohemia Creek just upstream of confluence.

Variance from field/analytical procedures or sampling approach:

Planned sampling locations were not accessible due to very steep terrain. Glenwood creek sampling location was moved approximately 1/2 mile upstream to more accessible location. Bohemia Creek attribution samples were not collected.

Reason for variance:

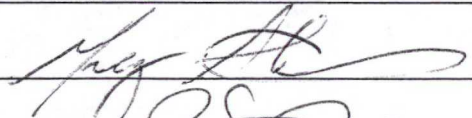
See above.

Special equipment, materials, or personnel required:

NA

Initiators name: David Dinkuhn

Date: 2/14/05

Project approval: 

Date: 2/21/05

QA Officer/reviewer: 

Date: 2/22/05

APPENDIX C
FIELD SAMPLING FORMS



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 2644 001.002.0153.00 Sampling Personnel: A. Barnes, D. Dinkuh
te: Oct 11, 04 Weather: Sunny, 54°F
Location Description: Background Soil
Uncorrected GPS Coordinates: 43° 34' 00.73" 122° 43' 41.62"
Corrected GPS Coordinates: _____
GPS File Name: R101201A✓ Sampling Method: bowl & spoon
WESTON Sample No: 4MM-SS-BK001-0000 Water Depth to Sediment: NA
EPA Sample No.: 04424050 / M/S47S7 Photograph: roll: DK1 exposure: 1
Analyses: TAL metals / PCB

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1810	0-4"	Red brown: 20% 30% gravel / 30% sand / 20% silt Scattered organics

Notes: Sample collected off Puddin Rock Road, steep slope, location
as shown on map, weathered rock

MS/MSD sample

Sampler's Signature: Dave Dinkuh

Project Number: 12644.001.002.0153.00 Sampling Personnel: A. Barnes, D. Dinkeln
 Date: Oct 12, 07 Weather: Sunny 60s
 Location Description: tailings "pile"
 Uncorrected GPS Coordinates: 43° 34' 45.58" 122° 31' 09.97"
 Corrected GPS Coordinates: _____
 GPS File Name: R101222A Sampling Method: bowl & spoon
 WESTON Sample No: WMM-SS-MS001-0000 Water Depth to Sediment: NA
 EPA Sample No.: 04429051/MJ47SB Photograph: roll: DK1 exposure: 2
 Analyses: TAL Metals 3

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1510	0-4"	10% gravel / 50% med-fine sand / 40% silt, red-brown color, moist, no organic material

Notes: location @ XRF screening #2, historic "pile" location
- erosion has spread the pile downhill

photo
#2: sample location facing south-northeast
3 overview of pile area, facing E

Sampler's Signature: Daniel Dinkeln



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

(3)

Project Number: 12644.001.002.0153.00Sampling Personnel: A. Barnes D. DinkuhnDate: Oct 12, 04Weather: Sunny 60sLocation Description: Waste rock pile #1Uncorrected GPS Coordinates: 43° 34' 45.98" 122° 39' 12.60"

Corrected GPS Coordinates: _____

GPS File Name: R101222B VSampling Method: bowl & spoonWESTON Sample No: UMM.SS.M5002.0000Water Depth to Sediment: NAEPA Sample No.: 04424052 / MJ47S9Photograph: roll: PK1 exposure: 4Analyses: TAL metals

Grab #	Time	Penetration Depth	Sample Material Physical Description [Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	15:00 1335	0-4"	45% gravel / 45% sand / 10% silt, red-brown in color damp, no organics

Notes: location @ screening #9

photo 3: standing on waste rock pile #1 facing ~~SE~~ NE
showing gravity separation area, tailings "pile"
photo 4: sample location, facing S

Sampler's Signature: _____

Project Number: 12644.001.002.0153.00 Sampling Personnel: A. Barnes, D. Dinkuh
 Date: Oct 12, 04 Weather: sunny 60s
 Location Description: Waste rock pile #2
 Uncorrected GPS Coordinates: 43° 34' 41.82" 122° 39' 11.58"
 Corrected GPS Coordinates: _____
 GPS File Name: R101222C ✓ Sampling Method: bowl & spoon
 WESTON Sample No: WMM-CS-MS003-0000 Water Depth to Sediment: NA
 EPA Sample No.: 04424053/MJ47T0 Photograph: roll: DK1 exposure: 5, 6
 Analyses: TAL metals

Grab #	Time	Penetration Depth	Sample Material Physical Description [Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	5:13:40	0-4"	50% gravel/40% sand/10% silt, red, orange brown in color

Notes: Sample collected @ screening location #12, in drainage down center of two peaks

photo ^{5:00} 5: Sample location showing two peaks of pile

photo ^{6:00} 6: showing drainage down center of pile

photo 7: adit sloping down

photo 8: entrance to adit

Sampler's Signature: David Dinkuh



SURFACE WATER FIELD SAMPLING RECORD

(5)

Project Name: Musick mine
Object Location: outside Cottage Grove, OR
Date: Oct 12, 04

Sampling Personnel: A. Barnes, D. Dinkum
Project Number: 12644.001.002.0153.00
Weather: clear, 50's

Sampling Point Number: NA Time: 1730 Depth to Sampling Point: surface
Location Description: confluence of City & Steamboat Springs Coordinates: 43°29'51.43" 122°35'54.35"
Access Method: off Steamboat Road Sampling Method: _____
Description of Sample (color, turbidity, odor): clear, colorless
WESTON Sample ID: WINM-SW-STE01-0000
EPA Sample Number: 644240S4 / MJ47T1

Sample Container(s)	Quantity	Analysis
<u>Poly-500mL</u>	<u>1</u>	<u>TAM metals</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

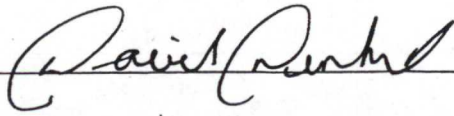
pH: 6.56

photo ~~1~~ 9 - confluence between City & Steamboat Creeks

Sampling Point Number: _____ Time: _____ Depth to Sampling Point: _____
Location Description: _____ Coordinates: _____
Access Method: _____ Sampling Method: _____
Description of Sample (color, turbidity, odor): _____
WESTON Sample ID: _____
EPA Sample Number: _____

Sample Container(s)	Quantity	Analysis
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Notes: _____

Sampler's Signature: 



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

(6)

Project Number: 2674 001.002.0153.00 Sampling Personnel: AB. D.D.
Date: Oct 12 04 Weather: Clear 50s
Location Description: Confluence of City & Steamboat Creeks
Uncorrected GPS Coordinates: 43° 29' 59.43" 122° 35' 54.35"
Corrected GPS Coordinates: _____
GPS File Name: R101300A* R101301B Sampling Method: bowls spoon
WESTON Sample No: Umm. SD. ST001.0000 Water Depth to Sediment: 0-3"
EPA Sample No.: 04424055/MJ47T2 Photograph: roll: DK1 exposure: 9
Analyses: TAL metals

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1735	0-4"	100% coarse-med sand, multicolored but overall grey-brown, trace organics such as evergreen leaves

Notes: Sample location ≈ 120ft S of GPS reading.

Left R101300A open & walked to new location, please use
R101301B

Sampler's Signature: _____



SURFACE WATER FIELD SAMPLING RECORD

(7)

Project Name: Murick mine Sampling Personnel: A. Baines, D. Pinkuhn
Project Location: Cottage Grove Project Number: 12644.001.002.0153.00
Date: Oct 12, 04 Weather: clear, 50s

Sampling Point Number: NA Time: 1810 Depth to Sampling Point: surface
Location Description: Steamboat Creek Coordinates: 43°29'59.93" 122°35'51.19"
Access Method: Steamboat Road Sampling Method: submerged bottle
Description of Sample (color, turbidity, odor): clear, colorless
WESTON Sample ID: Umm-SW-ST002-0000
EPA Sample Number: 04424056 / MJ47T3

Sample Container(s)	Quantity	Analysis
<u>Poly-500ml</u>	<u>1</u>	<u>TAl metals</u>
		<u>pH 5.8 to 6.60</u>

photo 10: Sample location, facing west, Dave using pH meter

Sampling Point Number: NA Time: 0830 Depth to Sampling Point: 0-2"
Location Description: Glenwood Creek Coordinates: 43°34'48.03" 122°40'30.90"
Access Method: walk through forest off of 2358 Sampling Method: Submerged bottle
Description of Sample (color, turbidity, odor): clear, colorless, some organics
WESTON Sample ID: LMM-SW-ST001-0000
EPA Sample Number: 04424058 / MJ47TS

Sample Container(s)	Quantity	Analysis
<u>poly-500ml</u>	<u>1</u>	<u>TAl metal</u>
		<u>pH 6.50</u>

Notes: photo 11: Glenwood Creek, upstream of sample location

Sampler's Signature: Dave Pinkuhn



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 12644-001-002-0153-00 Sampling Personnel: AB, DD
Date: Oct 12, 04 Weather: clear, 50s
Location Description: Steamboat Creek
Uncorrected GPS Coordinates: 43° 29' 51.43" 122° 35' 51.19"
Corrected GPS Coordinates: _____
GPS File Name: R101301A Sampling Method: Dredge Spoon
WESTON Sample No: Umm. SD ST002-0000 Water Depth to Sediment: 0-2"
EPA Sample No.: 04424057/MJ47T4 Photograph: roll: DK1 exposure: 10
Analyses: TAL metals 04424057

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1815	0-3"	100% coarse-med sand multicolored, overall brown-gray wet, few organics roots, insects

Notes: _____

Sampler's Signature: _____



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 12644.001.002.0153.00 Sampling Personnel: A.B, D.D.
Date: Oct 13, 04 Weather: clear, 40s
Location Description: Glenwood Creek
Uncorrected GPS Coordinates: 43° 34' 48.03" 122° 40' 30.90"
Corrected GPS Coordinates: _____
GPS File Name: R101315A Sampling Method: bowl & spoon
WESTON Sample No: LMM-SD-ST001-0000 Water Depth to Sediment: 0-6"
EPA Sample No.: 04427059 / MJ47T6 Photograph: roll: DK 1 exposure: 11
Analyses: TAL metals

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	0835	0-2"	60% gravel/40% sand, multicolored - overall light grey-brown, no organics

Notes: couldn't access confluence of Glenwood & Bohemia so collected sample on Glenwood upstream from confluence

Sampler's Signature: _____



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 12644-001-002-0153-00 Sampling Personnel: A. Barnes, D. Dinkuh
Date: Oct 13, 04 Weather: Sunny 40S
Location Description: Lower musick miner waste rock pile
Uncorrected GPS Coordinates: 43° 34' 52.20" 122° 39' 54.45"
Corrected GPS Coordinates: _____
GPS File Name: R101319A Sampling Method: Dowling Spoon
WESTON Sample No: LMM-SS-MSC001-0000 Water Depth to Sediment: NA
EPA Sample No.: 04424060/MJ47T7 Photograph: roll: DK1 exposure: 12-15
Analyses: TAL metals

PIB is view of
waste rock pile
slope

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1150	0-3"	50% gravel/20% coarse sand/30% fines, orangish-brown, damp, no organics

Notes: the sample was collected @ location #5 - screening loc.

photo 12: sample location, facing uphill

13: side of the upper portion of the waste rock pile

14: waste rock pile, side view

15: waste rock pile, facing downhill

waste rock pile

Sampler's Signature: [Signature]

Project Name: <u>Musick Mine</u>	Sampling Personnel: <u>AB, DO</u>
Object Location: <u>Cottage Grover</u>	Project Number: <u>12644.001.002.0153.00</u>
Date: <u>Oct 13, 07</u>	Weather: <u>Sunny 60s</u>

Sampling Point Number: NA Time: 1250 Depth to Sampling Point: surface

Location Description: Glenwood PPE Coordinates: _____

Access Method: Walk down along pile to creek Sampling Method: Submerged bottle

Description of Sample (color, turbidity, odor): Clear, colorless

WESTON Sample ID: LMM-SW-ST002-0000

EPA Sample Number: 04424061/MJ47T8

Sample Container(s)	Quantity	Analysis
<u>500 ml poly</u>	<u>1</u>	<u>TAL metal</u>
_____	_____	_____
_____	_____	<u>pH 6.5 - 7.63</u>
_____	_____	<u>paper machine</u>
_____	_____	_____

photo 16: downstream from sample location

Sampling Point Number: NA Time: 1330 Depth to Sampling Point: surface

Location Description: upstream Glenwood Coordinates: 43° 34' 56.01 122° 39' 52.96

Access Method: Walk up from PPE Sampling Method: submerged bottles

Description of Sample (color, turbidity, odor): clear, colorless

WESTON Sample ID: LMM-SW-ST003-0000

EPA Sample Number: 04424063/MJ47W0

Sample Container(s)	Quantity	Analysis
<u>500ml poly</u>	<u>1</u>	<u>TAL metals</u>
_____	_____	_____
_____	_____	<u>pH 7.74</u>
_____	_____	_____

photo 17: downstream from collection pt.

Notes: sample collected on Glenwood Creek right @ property boundary for Musick Mine

Sampler's Signature: [Signature]

Project Number: 12644.001.002.0153.00 Sampling Personnel: AB, DD
 Date: Oct 13, 04 Weather: Sunny, 60S
 Location Description: Glenwood Creek PPE
 Uncorrected GPS Coordinates: couldn't get
 Corrected GPS Coordinates: _____
 GPS File Name: _____ Sampling Method: bowls & spoon
 WESTON Sample No: LMM-80-ST002 0000 Water Depth to Sediment: 6"
 EPA Sample No.: 04424062/MJ47T9 Photograph: roll: DK1 exposure: 16
 Analyses: JAL metals

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1300	0-3"	60% gravel / 20% coarse sand / 20% silt, multicolored brown-red, wet, some organics

Notes: photo 16, downstream

- location is down gradient of waste rock pile

Sampler's Signature: [Signature]



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 12644.001.002.053.00 Sampling Personnel: A.B., D.D.
Date: Oct 13, 04 Weather: Sunny 60s
Location Description: upstream Glenwood Creek @ property boundary
Uncorrected GPS Coordinates: 43° 34' 56.01" 122° 39' 52.96"
Corrected GPS Coordinates: _____
GPS File Name: R101320A Sampling Method: bowl & spoon
WESTON Sample No.: LMM-SD-ST003-0000 Water Depth to Sediment: 0-4"
EPA Sample No.: 04424064, MJ47W1 Photograph: roll: DK1 exposure: 17
Analyses: TAL metals

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1340	0-2"	50% gravel/30% med. sand/20% silt dark brown wet, organics such as roots & leaves

Notes: sample was collect upstream of any attribution from waste rock pile @ property boundary

Sampler's Signature: _____



SURFACE WATER FIELD SAMPLING RECORD

Project Name: MUSICK MINE PA/SI
Project Location: _____
Date: 10/13/04

Sampling Personnel: DLD/AB
Project Number: 12644.001-002.0153.06
Weather: _____

Sampling Point Number: _____ Time: 1430^{DLD} 25 Depth to Sampling Point: 0"
Location Description: LOWER MUSICK MINE ADIT DRAINAGE Coordinates: _____
Access Method: _____ Sampling Method: DIP

Description of Sample (color, turbidity, odor): _____
WESTON Sample ID: LMM - SW - MS002-0000
EPA Sample Number: 044240645^{AB} MJ47W2

Sample Container(s)	Quantity	Analysis
<u>500 ml</u>	<u>1</u>	<u>TAL MET.</u>
_____	_____	_____
_____	_____	_____

pH MEAS. 7.58 METER CHECKED OK AGAINST STANDARDS JUST BEFORE MEAS.

Sampling Point Number: _____ Time: _____ Depth to Sampling Point: _____
Location Description: _____ Coordinates: _____
Access Method: _____ Sampling Method: _____
Description of Sample (color, turbidity, odor): _____
WESTON Sample ID: _____
EPA Sample Number: _____

Sample Container(s)	Quantity	Analysis
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Notes: FLOW FROM ADIT ~ 10 GPM

Sampler's Signature: David Dinkuba



MUSICK MINEPA/ST
SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

17

Project Number: 12644-001.002.0153.00 Sampling Personnel: DLD/AB
Date: 10/13/04 Weather: HOT 75°F
Location Description: LOWER MUSIC MINE ADIT
Uncorrected GPS Coordinates: 43 34 51.80 122 39 53.86
Corrected GPS Coordinates: _____
GPS File Name: R101321A Sampling Method: B+S
WESTON Sample No: LMM-GD-MS002-0000 Water Depth to Sediment: _____
EPA Sample No.: 0442 4063 06/MJ47W3 Photograph: roll: DK1 exposure: 19
Analyses: TAL MET. 20
21

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1430	0-3	SILTY SANDY GRAVEL, 5/50.04 SILTY, GRAVELLY SAND, 5/30/65, RED-BN, WET

Notes: 1 - 402 JAR

Sampler's Signature: David Dinkelman



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 12644 001 002 0153 00 Sampling Personnel: AB, DD
Date: Oct 13, 04 Weather: _____
Location Description: Confluence of City Creek & Drainage from Upper Waste Rock, it
Uncorrected GPS Coordinates: UMM - PPE
Corrected GPS Coordinates: _____
GPS File Name: R101323A Sampling Method: bowl & spoon
WESTON Sample No.: UMM-SD-ST003 0000 Water Depth to Sediment: 1-2"
EPA Sample No.: 04424067/MJ47W4 Photograph: roll: DK-1 exposure: 23 & 24 (p4)
Analyses: TAL metals 24 & 25

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1550	0-2"	50% gravel / 48 49% sand / 2% silt, multicolored dark brown, wet, organics

Notes: - couldn't get GPS, location is south of large tree is clearing from ~~tree~~ ~ 100ft. Disregard file R101323A

photos 23 & 24 - showing confluence from sampling location

Sampler's Signature: _____

SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: <u>12644.001.002.0153.00</u>	Sampling Personnel: <u>AB, DD</u>
Date: <u>Oct 13, 04</u>	Weather: <u>clear, 50s</u>
Location Description: <u>Confluence of City Creek & drainage from Lower Area, UMM-PPE</u>	
Uncorrected GPS Coordinates: <u>43° 34' 46.68" 122° 39' 06.16"</u>	
Corrected GPS Coordinates: _____	
GPS File Name: <u>R101323B?</u>	Sampling Method: <u>bowl & spoon</u>
WESTON Sample No: <u>UMM-SD-ST004.0000</u>	Water Depth to Sediment: <u>0-2"</u>
EPA Sample No: <u>04424068/M/J47W5</u>	Photograph: roll: <u>DK2</u> exposure: <u>1</u>
Analyses: <u>TAL Metals, PCB/pesticides</u>	

Grab #	Time	Penetration Depth	Sample Material Physical Description [Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1620	0-2"	60% sand / 40% gravel, multicolored - brown, no organics

Notes: location is ~ 200ft down gradient of tailings pile

Photo 1: confluence of areas described above

Sampler's Signature: [Signature]



SURFACE WATER FIELD SAMPLING RECORD

Project Name: Musick Mine Sampling Personnel: AB, DD
Project Location: Cottage Grove Project Number: 12644.001.002.0153.00
Date: Oct 13, 04 Weather: Clear, 50s

Sampling Point Number: NA Time: 1700 Depth to Sampling Point: surface
Location Description: lower adit @ umm Coordinates: File No 14016 43°34'45.27" 122°39'13.91"
Access Method: from path that runs behind pile Sampling Method: used jar to scoop water
Description of Sample (color, turbidity, odor): clear slightly yellow
WESTON Sample ID: umm SW MScot 0000
EPA Sample Number: 04424069 / MJ47W6

Sample Container(s)	Quantity	Analysis
<u>500 mL poly</u>	<u>1</u>	<u>TAL metals</u>

no sediment @ adit
photo 15-010
14 adit (lower)

Sampling Point Number: _____ Time: _____ Depth to Sampling Point: _____
Location Description: _____ Coordinates: _____
Access Method: _____ Sampling Method: _____
Description of Sample (color, turbidity, odor): _____
WESTON Sample ID: _____
EPA Sample Number: _____

Sample Container(s)	Quantity	Analysis

Notes: _____

Sampler's Signature: David G. Gindelman



SURFACE WATER FIELD SAMPLING RECORD

Project Name: <u>MUSICK MINE</u>	Sampling Personnel: <u>DLO/AB</u>
Project Location: _____	Project Number: <u>12644-001-002 0153-00</u>
Date: <u>10/13/04</u>	Weather: <u>CLEAR 60°F</u>

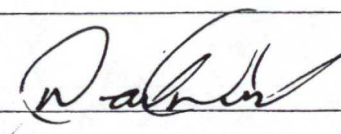
Sampling Point Number: NA Time: 1710 Depth to Sampling Point: 0"
Location Description: confluence of unnamed creek @ prop boundary to the west Coordinates: Not available
Access Method: _____ Sampling Method: Submerged bottle
Description of Sample (color, turbidity, odor): _____
WESTON Sample ID: 4MM1-SW-ST005-0000
EPA Sample Number: 04424070/MJ47W7

Sample Container(s)	Quantity	Analysis
<u>500 ml</u>	<u>2</u>	<u>TAL METALS</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
<u>photo DK 2:24:3</u>	_____	_____

Sampling Point Number: _____ Time: _____ Depth to Sampling Point: _____
Location Description: _____ Coordinates: _____
Access Method: _____ Sampling Method: _____
Description of Sample (color, turbidity, odor): _____
WESTON Sample ID: _____
EPA Sample Number: _____

Sample Container(s)	Quantity	Analysis
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Notes: _____

Sampler's Signature: 



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 12644-001-002-0153-00 Sampling Personnel: DLD
Date: 10/13/04 Weather: 60° Clear
Location Description: CONFL. OF UNNAMED CK Down @ Prop. Bdry. DOWNST. OF
Uncorrected GPS Coordinates: PPE 2. UMM Alpharetta CK.
Corrected GPS Coordinates: NO GPS HQ. - TREE COVER
GPS File Name: NA Sampling Method: B&S
WESTON Sample No: UMM-SD-ST005-0000 Water Depth to Sediment: _____
EPA Sample No.: 04424071 / MJ47W8 Photograph: roll: DK2 exposure: 2
Analyses: TAL METALS 3

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
	1115	0"-3"	SANDY GRAVEL, 45/55, LT GY BN, LET NO ORGS.

Notes: _____

Sampler's Signature: David Dinkels

SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: <u>12644.001.002.0153.00</u>	Sampling Personnel: <u>AB, DD</u>
Date: <u>OCT 13, 04</u>	Weather: _____
Location Description: <u>Stamp Mill</u>	
Uncorrected GPS Coordinates: <u>43° 34' 46.47" 122° 39' 11.49"</u>	
Corrected GPS Coordinates: _____	
GPS File Name: <u>R101401A</u>	Sampling Method: <u>bowl & spoon</u>
WESTON Sample No.: <u>UMIN.SS.MS005.0000</u>	Water Depth to Sediment: <u>NA</u>
EPA Sample No.: <u>04424072 / M/J47W9</u>	Photograph: roll: <u>DK2</u> exposure: _____
Analyses: <u>TAL metals / Pests / PCBs</u>	

Grab #	Time	Penetration Depth	Sample Material Physical Description [Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1720	0-2"	20% 30% gravel 40% sand / 10% fines, dark brown, damp, moss growing on top, fishy smell

Notes: Sample Collected From Location 5 ^{DD}
photo 4-11 → upper music mine, lower waste rock pile
tailing pile w/ stream, gravity separation area

photo 12: lower mill area
photo 13: upper mill area
photos 16-22 SITE VIEWS, waste rock piles @ UMIN ^{DD}

Sampler's Signature: [Signature]

Project Name: <u>Musick Mine</u>	Sampling Personnel: <u>AB, DD</u>
Project Location: <u>outside Cottage Grove</u>	Project Number: <u>2644-001-0020153.00</u>
Date: <u>Oct 14, 04</u>	Weather: <u>Sunny 50s</u>

Sampling Point Number: _____ Time: 1110 Depth to Sampling Point: _____

Location Description: Unnamed trib between Sharps & Puddin' Rock Creek Coordinates: _____

Access Method: drive off Martin Creek Rd #23 Sampling Method: submerged bottle

Description of Sample (color, turbidity, odor): clear, colorless

WESTON Sample ID: LMM-SW-BK002 0000

EPA Sample Number: 09424073 / M/J47X0

Sample Container(s)	Quantity	Analysis
<u>500 ML poly</u>	<u>1</u>	<u>TAL metal</u>

photo DK3, 2 tributary.

Sampling Point Number: _____ Time: _____ Depth to Sampling Point: _____

Location Description: _____ Coordinates: _____

Access Method: _____ Sampling Method: _____

Description of Sample (color, turbidity, odor): _____

WESTON Sample ID: _____

EPA Sample Number: _____

Sample Container(s)	Quantity	Analysis

Notes: photo DK3, 2 - unnamed trib, drains to Martin Creek, in between Sharps & Puddin' Rock Rd

Sampler's Signature: [Signature]



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 2644.001.002.0153.00 Sampling Personnel: AB
Date: Oct 14, 04 Weather: _____
Location Description: Unnamed trib between Sharps Creek & Puddin Rock Creek
Uncorrected GPS Coordinates: _____
Corrected GPS Coordinates: _____
GPS File Name: _____ Sampling Method: bowl & spoon
WESTON Sample No: 4MM-SD-BK002-0000 Water Depth to Sediment: 0-2"
EPA Sample No.: 04424074/M/147X1 Photograph: roll: DK3 exposure: 2
Analyses: TAL metals / PCB/pest

Grab #	Time	Penetration Depth	Sample Material Physical Description
			[Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.]
1	1115	0-1"	00% gravel / 40% coarse-med. sand, light brown, wet, no organics

Notes: - this location was selected as the background location on the Lower Musick mine side because it has no upgradient potential sources.

- couldn't obtain GPS coordinates

Sampler's Signature: _____

David Rinkholm

SURFACE WATER FIELD SAMPLING RECORD

Project Name: Music de mine
Project Location: Mulside Cottage Grove
Date: Oct 14, 04

Sampling Personnel: AB, DD
Project Number: 12644.001.002.0153.00
Weather: Sunny 60s

Sampling Point Number: NA Time: 1330 Depth to Sampling Point: surface

Location Description: Unnamed trib from evening Coordinates: NA

Access Method: Mike Forrest Service trail thru mine Sampling Method: submerged bottle

Description of Sample (color, turbidity, odor): Clear, colorless

WESTON Sample ID: WMM-SW-STOOL-0000

EPA Sample Number: 04424075 / MJ47X2

<u>Sample Container(s)</u>	<u>Quantity</u>	<u>Analysis</u>
----------------------------	-----------------	-----------------

500mL poly	1	TAL Metal
------------	---	-----------

6.5 pt x/yr

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

Sampling Point Number: _____ Time: _____ Depth to Sampling Point: _____

Location Description: _____ Coordinates: _____

Access Method: _____ Sampling Method: _____

Description of Sample (color, turbidity, odor): _____

WESTON Sample ID: _____

EPA Sample Number: _____

| <u>Sample Container(s)</u> | <u>Quantity</u> | <u>Analysis</u> |
|----------------------------|-----------------|-----------------|
|----------------------------|-----------------|-----------------|

plate 663 #7 obsidian 1-1-1 (unit 8.00)

Notes: photo DKS + stream bear waterfall

2011

Sampler's Signature: David Henderson

U:\Projects\EPA START 10\Resources\Field Forms\Surface Water Field Sample Record Form.doc



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

Project Number: 12644.001.002.0153.00 Sampling Personnel: AB, DD
Date: Oct 14, 04 Weather: sunny 60s
Location Description: Unnamed trib from Evening Mine
Uncorrected GPS Coordinates: _____
Corrected GPS Coordinates: _____
GPS File Name: _____ Sampling Method: hand & spoon
WESTON Sample No: Umm 80.8006.0000 Water Depth to Sediment: NA
EPA Sample No.: 04424076/MJ47X3 Photograph: roll: DK3 exposure: 7
Analyses: TAL metals

| Grab # | Time | Penetration Depth | Sample Material Physical Description |
|--------|------|-------------------|---|
| | | | [Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.] |
| 1 | 1335 | 0-2" | 70% gravel / 30% sand, grey brown, dry, organics such as evergreen leaves |
| | | | |
| | | | |

Notes: Water running @ stream drains to groundwater, creek bed dry.

No GPS Acquisition

Sampler's Signature: _____

Peter Runkel

SURFACE WATER FIELD SAMPLING RECORD

| | |
|---|--|
| Project Name: <u>Musick Mine</u> | Sampling Personnel: <u>AB, AP</u> |
| Project Location: <u>Cottage Br Grove</u> | Project Number: <u>12644.001.002.0153.00</u> |
| Date: <u>Oct 14, 04</u> | Weather: <u>sunny 60s</u> |

Sampling Point Number: NA Time: 1540 Depth to Sampling Point: Surface

Location Description: Nelson Creek, bkgd Coordinates: _____

Access Method: Champion Creek Road Sampling Method: Submerged bottle

Description of Sample (color, turbidity, odor): _____

WESTON Sample ID: Wmm SW BK001.0000

EPA Sample Number: 044276 4077 / MJ47X4

| Sample Container(s) | Quantity | Analysis |
|---------------------|----------|-------------------|
| <u>500 ml poly</u> | <u>1</u> | <u>TAL metals</u> |
| | | |
| | | |
| | | |
| | | |

Sampling Point Number: _____ Time: _____ Depth to Sampling Point: _____

Location Description: _____ Coordinates: _____

Access Method: _____ Sampling Method: _____

Description of Sample (color, turbidity, odor): _____

WESTON Sample ID: _____

EPA Sample Number: _____

| Sample Container(s) | Quantity | Analysis |
|---------------------|----------|----------|
| | | |
| | | |
| | | |
| | | |
| | | |

Notes: photo X3, 8: sample location on Nelson Creek.

Sampler's Signature: [Signature]



SURFACE SOIL/SEDIMENT FIELD SAMPLING RECORD

21

Project Number: 2644.001.002 0153.00 Sampling Personnel: AB, DD
Date: Oct 14, 04 Weather: Sunny 60s
Location Description: Nelson Creek, Umm Bkgd Sample
Uncorrected GPS Coordinates: _____
Corrected GPS Coordinates: _____
GPS File Name: _____ 3 per Sampling Method: Bowl & Spoon
WESTON Sample No: UMM-SD-BK001.0000 Water Depth to Sediment: 0-2"
EPA Sample No.: 01424078/MJ47X5 Photograph: roll: DK3 exposure: 8
Analyses: TAL metals / PCBs, pests

| Grab # | Time | Penetration Depth | Sample Material Physical Description |
|--------|------|-------------------|---|
| | | | [Grain Size (% gravel/sand/silt/clay), Color, Odor, Slag, Organics, Debris, Etc.] |
| 1 | 1545 | 0-2" | 65% gravel / 35% sand (coarse-med), grey brown wet, no organics |
| | | | |
| | | | |

Notes: location is bkgd for eastern side of ridge
no mine workings up gradient

photo 8: Nelson Creek Sample location

No GPS Acquisition

Sampler's Signature: Paul Reinhold

APPENDIX D

DATA VALIDATION MEMORANDA AND LABORATORY SHEETS



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

Orig
received
1/10/05

January 7, 2005

MEMORANDUM

SUBJECT: Data validation report for the pesticides/polychlorinated biphenyls (pest/PCBs) analysis of samples from Musick Mine PA/SI Case: 33419 SDG: J47S7

FROM: Brandon Perkins, QA Chemist *BP*
Office of Environmental Assessment

TO: Joanne Labaw, Site Assessment Manager
Office of Environmental Cleanup

CC: David Dinkuhn, Project Manager
Weston Solutions

The quality assurance (QA) review of 5 soil samples collected from the above referenced site has been completed. The samples were analyzed for pest/PCBs in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analysis- OLM04.3. The analyses were performed by Ceimic Corporation of Narragansett, RI. The following samples were reviewed in this validation report:

SDG: J47S7

J47S7 J47W5 J47W9 J47X1 J47X5

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control (QC) Specifications outlined in the USEPA CLP SOW for Organic Analysis (OLM04.3) and the USEPA CLP National Functional Guidelines for Organic Data Review (10/99).

The conclusions presented herein are based on the information provided for the review.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Acceptable

Sample J47S7 was designated as QC samples for pests/PCB MS/MSD analyses. The criteria for frequency of analysis, spike recoveries and relative percent differences (RPDs) between MS and MSD results were met. None of the data were qualified on this basis.

Compound Identification

All of the compounds detected were within the established retention time windows and were judged to be acceptable. None of the data were qualified on this basis.

Florisil Cartridge Check - Acceptable

The frequency of analysis and recovery criteria of florisil used during pests/PCB clean-up were met. None of the data were qualified on this basis.

Gel Permeation Chromatography (GPC) Check - Acceptable

The frequency of analysis and recovery criteria of GPC clean-up checks were met. None of the data were qualified on this basis.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points evaluated was 140. None of the data was qualified.

All of the samples were analyzed in accordance with technical specifications outlined in the SOW. The data, as qualified, are acceptable and can be used for all purposes.

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J47S7

Lab Name: CEIMIC CORP

Contract: 68-W-03-018

Lab Code: CEIMIC

Case No.: 33419

SAS No.:

SDG No.: J47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 041119-01

Sample wt/vol: 30.0(g/mL) G

Lab File ID: _____

% Moisture: 10 Decanted: (Y/N) N

Date Received: 10/15/04

Extraction: (Type) SONC

Date Extracted: 10/18/04

Concentrated Extract Volume: 5000(uL)

Date Analyzed: 10/22/04

Injection Volume: 1.0(uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.4

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG Q

| CAS NO. | COMPOUND | | |
|------------|---------------------|-----|---|
| 319-84-6 | alpha-BHC | 1.9 | U |
| 319-85-7 | beta-BHC | 1.9 | U |
| 319-86-8 | delta-BHC | 1.9 | U |
| 58-89-9 | gamma-BHC (Lindane) | 1.9 | U |
| 76-44-8 | Heptachlor | 1.9 | U |
| 309-00-2 | Aldrin | 1.9 | U |
| 1024-57-3 | Heptachlor epoxide | 1.9 | U |
| 959-98-8 | Endosulfan I | 1.9 | U |
| 60-57-1 | Dieldrin | 3.7 | U |
| 72-55-9 | 4,4'-DDE | 3.7 | U |
| 72-20-8 | Endrin | 3.7 | U |
| 33213-65-9 | Endosulfan II | 3.7 | U |
| 72-54-8 | 4,4'-DDD | 3.7 | U |
| 1031-07-8 | Endosulfan sulfate | 3.7 | U |
| 50-29-3 | 4,4'-DDT | 3.7 | U |
| 72-43-5 | Methoxychlor | 19 | U |
| 53494-70-5 | Endrin ketone | 3.7 | U |
| 7421-93-4 | Endrin aldehyde | 3.7 | U |
| 5103-71-9 | alpha-Chlordane | 1.9 | U |
| 5103-74-2 | gamma-Chlordane | 1.9 | U |
| 8001-35-2 | Toxaphene | 190 | U |
| 12674-11-2 | Aroclor-1016 | 37 | U |
| 11104-28-2 | Aroclor-1221 | 74 | U |
| 11141-16-5 | Aroclor-1232 | 37 | U |
| 53469-21-9 | Aroclor-1242 | 37 | U |
| 12672-29-6 | Aroclor-1248 | 37 | U |
| 11097-69-1 | Aroclor-1254 | 37 | U |
| 11096-82-5 | Aroclor-1260 | 37 | U |

B
FEB 15 2005

FORM I PEST

OLM04.3

014

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J47W9

Lab Name: CEIMIC CORP

Contract: 68-W-03-018

Lab Code: CEIMIC

Case No.: 33419

SAS No.:

SDG No.: J47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 041119-03

Sample wt/vol: 30.1(g/mL) G

Lab File ID: _____

% Moisture: 24 Decanted: (Y/N) N

Date Received: 10/15/04

Extraction: (Type) SONC

Date Extracted: 10/18/04

Concentrated Extract Volume: 5000(uL)

Date Analyzed: 10/23/04

Injection Volume: 1.0(uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 4.5

Sulfur Cleanup: (Y/N) N

CAS NO.

COMPOUND

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG Q

| | | | |
|------------|---------------------|-----|---|
| 319-84-6 | alpha-BHC | 2.2 | U |
| 319-85-7 | beta-BHC | 2.2 | U |
| 319-86-8 | delta-BHC | 2.2 | U |
| 58-89-9 | gamma-BHC (Lindane) | 2.2 | U |
| 76-44-8 | Heptachlor | 2.2 | U |
| 309-00-2 | Aldrin | 2.2 | U |
| 1024-57-3 | Heptachlor epoxide | 2.2 | U |
| 959-98-8 | Endosulfan I | 2.2 | U |
| 60-57-1 | Dieldrin | 4.3 | U |
| 72-55-9 | 4,4'-DDE | 4.3 | U |
| 72-20-8 | Endrin | 4.3 | U |
| 33213-65-9 | Endosulfan II | 4.3 | U |
| 72-54-8 | 4,4'-DDD | 4.3 | U |
| 1031-07-8 | Endosulfan sulfate | 4.3 | U |
| 50-29-3 | 4,4'-DDT | 4.3 | U |
| 72-43-5 | Methoxychlor | 22 | U |
| 53494-70-5 | Endrin ketone | 4.3 | U |
| 7421-93-4 | Endrin aldehyde | 4.3 | U |
| 5103-71-9 | alpha-Chlordane | 2.2 | U |
| 5103-74-2 | gamma-Chlordane | 2.2 | U |
| 8001-35-2 | Toxaphene | 220 | U |
| 12674-11-2 | Aroclor-1016 | 43 | U |
| 11104-28-2 | Aroclor-1221 | 88 | U |
| 11141-16-5 | Aroclor-1232 | 43 | U |
| 53469-21-9 | Aroclor-1242 | 43 | U |
| 12672-29-6 | Aroclor-1248 | 43 | U |
| 11097-69-1 | Aroclor-1254 | 43 | U |
| 11096-82-5 | Aroclor-1260 | 43 | U |

B
FEB 15 2005

BP
1/7/05

FORM I PEST

OLM04

025

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J47X5

Lab Name: CEIMIC CORP

Contract: 68-W-03-018

Lab Code: CEIMIC

Case No.: 33419

SAS No.:

SDG No.: J47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 041119-05

Sample wt/vol: 30.1(g/mL) G

Lab File ID: _____

% Moisture: 25 Decanted: (Y/N) N

Date Received: 10/16/04

Extraction: (Type) SONC

Date Extracted: 10/19/04

Concentrated Extract Volume: 5000(uL)

Date Analyzed: 10/23/04

Injection Volume: 1.0(uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.1

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG Q

| CAS NO. | COMPOUND | CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG Q |
|------------|---------------------|---|
| 319-84-6 | alpha-BHC | 2.3 U |
| 319-85-7 | beta-BHC | 2.3 U |
| 319-86-8 | delta-BHC | 2.3 U |
| 58-89-9 | gamma-BHC (Lindane) | 2.3 U |
| 76-44-8 | Heptachlor | 2.3 U |
| 309-00-2 | Aldrin | 2.3 U |
| 1024-57-3 | Heptachlor epoxide | 2.3 U |
| 959-98-8 | Endosulfan I | 2.3 U |
| 60-57-1 | Dieldrin | 4.4 U |
| 72-55-9 | 4,4'-DDE | 4.4 U |
| 72-20-8 | Endrin | 4.4 U |
| 33213-65-9 | Endosulfan II | 4.4 U |
| 72-54-8 | 4,4'-DDD | 4.4 U |
| 1031-07-8 | Endosulfan sulfate | 4.4 U |
| 50-29-3 | 4,4'-DDT | 4.4 U |
| 72-43-5 | Methoxychlor | 23 U |
| 53494-70-5 | Endrin ketone | 4.4 U |
| 7421-93-4 | Endrin aldehyde | 4.4 U |
| 5103-71-9 | alpha-Chlordane | 2.3 U |
| 5103-74-2 | gamma-Chlordane | 2.3 U |
| 8001-35-2 | Toxaphene | 230 U |
| 12674-11-2 | Aroclor-1016 | 44 U |
| 11104-28-2 | Aroclor-1221 | 89 U |
| 11141-16-5 | Aroclor-1232 | 44 U |
| 53469-21-9 | Aroclor-1242 | 44 U |
| 12672-29-6 | Aroclor-1248 | 44 U |
| 11097-69-1 | Aroclor-1254 | 44 U |
| 11096-82-5 | Aroclor-1260 | 44 U |

B

FEB 15 2005

BP
1/7/05

FORM I PEST

OLM04.3

035



8016
RECEIVED
11/12/04

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

November 10, 2004

Reply To
Attn. Of: OEA-095

MEMORANDUM

SUBJECT: Data Validation for Musick Mine PA/SI, Case# 33419,
SDG: MJ47S7, Metals Analysis

FROM: Donald Matheny, Chemist *DM*
Technical Support Unit, OEA

TO: Joanne LaBaw, Regional Project Manager
Office of Environmental Cleanup

CC: David Dinkuhn, Weston Solutions

The data validation of metals analysis for the above sample set is complete. Eighteen (18) soil samples were analyzed for metals by Sentinel Inc., Huntsville, AL. Sample numbers for this delivery group are as follows:

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| MJ47S7 | MJ47S8 | MJ47S9 | MJ47T0 | MJ47T2 | MJ47T4 |
| MJ47T6 | MJ47T7 | MJ47T9 | MJ47W1 | MJ47W3 | MJ47W4 |
| MJ47W5 | MJ47W8 | MJ47W9 | MJ47X1 | MJ47X3 | MJ47X5 |

DATA QUALIFICATIONS

The following comments refer to the lab's performance in meeting quality control specifications outlined in the "CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM05.3", the "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540/R-94-013" and the judgment of the reviewer. The comments presented herein are based on the information provided for the review.

1.0 TIMELINESS - Acceptable

The holding time from the date of collection to the date of digestion and analyses were met for all metals (metals 180 days, mercury 28 days). Samples were collected on 10/11/04 thru 10/14/04. ICP-AES analysis was conducted on 10/25/04 thru 10/29/04 and mercury analysis on 10/26/04 thru 10/28/04.

2.0 INSTRUMENT CALIBRATION/VERIFICATION - Acceptable

For ICP-AES analysis, instrument calibration was performed in accordance with method requirements. Recoveries for instrument verification standards (95-103%) met the frequency (10%) and recovery (90-110%) criteria.

For mercury analysis, the instrument was calibrated with a blank and five standards. The correlation coefficient (0.999) met the criterion (≥ 0.995). Recoveries for verification standards (90-116%) met the frequency (10%) and recovery (80-120%) criteria.

Quantitation verification standards met both the frequency and recovery criteria for all metals.

3.0 ICP-AES INTERFERENCE CHECK SAMPLE (ICS) - Acceptable

An ICS was analyzed at the required frequency for each analytical run. ICS recoveries met the recovery criterion (80-120% or $\pm 2\text{xCRDL}$) for all metals.

4.0 LABORATORY CONTROL SAMPLES (LCS) - Acceptable

All metals results for the LCS were within the established control limits for soils.

5.0 BLANKS

Preparation and instrument control blanks were prepared and analyzed in accordance with method requirements. Blank results were either non-detected or below a factor that could impact analytical sample results with the exception of antimony, cadmium and selenium. Affected samples were qualified (U) for these analytes.

6.0 MATRIX SPIKE ANALYSIS

A matrix spike analysis was performed for sample MJ47S7. The percent recovery range for this sample (81-97%) was within the recovery criterion (75-125%) for all analytes with the exception of antimony (35%) and lead (69%). Antimony and lead values were qualified (JL) or (UJL).

7.0 DUPLICATE SAMPLE ANALYSIS - Acceptable

A duplicate sample analysis was performed for sample MJ47S7. The range of relative percent differences ($< 12\%$) for this sample was within the control limits ($\pm 35\%$ or $\pm 2\text{xCRDL}$) for soils.

8.0 ICP-AES SERIAL DILUTION

A five-fold serial dilution was performed for sample MJ47S7. Percent differences ($\leq 9\%$) were within the control criterion ($\leq 10\%$) for all applicable metals with the exception of beryllium (18%) and magnesium (16%). Beryllium and magnesium values were qualified (JL).

9.0 ASSESSMENT SUMMARY

The following is a summary of qualified data: The (J) qualifier applied by the laboratory, represents results that are estimated. These values fall within a concentration range that is above the method detection limit but below the laboratory's quantitation limit. A number of reported values for antimony, cadmium and selenium were qualified (U) due to the detected presence of these analytes in the instrument verification blanks. Antimony and lead values were qualified (JL or UJL) due to low recoveries of the matrix spike. Antimony and lead values may be biased low. Beryllium and magnesium values were qualified (JL) due to uncertainties associated with the serial dilution results. Beryllium and magnesium values may be biased low.

DATA QUALIFIERS

- U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- J - The associated value is an estimated quantity.
- R - The data are unusable. The analyte may or may not be present in the sample.
- UJ - The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

PROJECT SPECIFIC DATA QUALIFIERS:

- L - Low bias.
- H - High bias.
- K - Unknown Bias.

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47S7

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08751

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 91.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|------|----|
| 7429-90-5 | Aluminum | 7650 | | | P |
| 7440-36-0 | Antimony | 6.6 | J | HJJK | P |
| 7440-38-2 | Arsenic | 1.8 | | | P |
| 7440-39-3 | Barium | 308 | | | P |
| 7440-41-7 | Beryllium | 0.65 | | HJKK | P |
| 7440-43-9 | Cadmium | 0.18 | J | U | P |
| 7440-70-2 | Calcium | 2450 | | | P |
| 7440-47-3 | Chromium | 1.3 | | | P |
| 7440-48-4 | Cobalt | 4.7 | J | BSK | P |
| 7440-50-8 | Copper | 8.5 | | | P |
| 7439-89-6 | Iron | 20200 | | | P |
| 7439-92-1 | Lead | 9.5 | | HJL | P |
| 7439-95-4 | Magnesium | 500 | J | HJKK | P |
| 7439-96-5 | Manganese | 1090 | | | P |
| 7439-97-6 | Mercury | 0.03 | J | BSK | CV |
| 7440-02-0 | Nickel | 1.7 | J | BSK | P |
| 7440-09-7 | Potassium | 1570 | | | P |
| 7782-49-2 | Selenium | 0.91 | J | U | P |
| 7440-22-4 | Silver | 1.1 | U | | P |
| 7440-23-5 | Sodium | 248 | J | BSK | P |
| 7440-28-0 | Thallium | 2.7 | U | | P |
| 7440-62-2 | Vanadium | 16.8 | | | P |
| 7440-66-6 | Zinc | 33.3 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts

Comments:

FEB 15 2005

LMM
TALING1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47S8

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08752

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 65.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-------|----|
| 7429-90-5 | Aluminum | 7780 | | | P |
| 7440-36-0 | Antimony | 84.9 | | # JL | P |
| 7440-38-2 | Arsenic | 611 | | | P |
| 7440-39-3 | Barium | 25.4 | J | BSK | P |
| 7440-41-7 | Beryllium | 0.73 | J | # JKK | P |
| 7440-43-9 | Cadmium | 2.2 | | | P |
| 7440-70-2 | Calcium | 759 | U | | P |
| 7440-47-3 | Chromium | 5.3 | | | P |
| 7440-48-4 | Cobalt | 1.7 | J | BSK | P |
| 7440-50-8 | Copper | 928 | | | P |
| 7439-89-6 | Iron | 65800 | | | P |
| 7439-92-1 | Lead | 6280 | | # JL | P |
| 7439-95-4 | Magnesium | 415 | J | # JKK | P |
| 7439-96-5 | Manganese | 98.1 | | | P |
| 7439-97-6 | Mercury | 16.9 | | | CV |
| 7440-02-0 | Nickel | 1.0 | J | BSK | P |
| 7440-09-7 | Potassium | 323 | J | BSK | P |
| 7782-49-2 | Selenium | 4.0 | J | BSK | P |
| 7440-22-4 | Silver | 14.9 | | | P |
| 7440-23-5 | Sodium | 759 | U | | P |
| 7440-28-0 | Thallium | 4.2 | | | P |
| 7440-62-2 | Vanadium | 17.6 | | | P |
| 7440-66-6 | Zinc | 824 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

Comments:

B

FEB 15 2005

12

LMM
W.E. #11A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47S9

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08753

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 94.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 2470 | | | P |
| 7440-36-0 | Antimony | 383 | | # JL | P |
| 7440-38-2 | Arsenic | 938 | | | P |
| 7440-39-3 | Barium | 157 | | | P |
| 7440-41-7 | Beryllium | 0.18 | ✓ | # JK BSK | P |
| 7440-43-9 | Cadmium | 2.8 | | | P |
| 7440-70-2 | Calcium | 109 | ✓ | BSK | P |
| 7440-47-3 | Chromium | 1.5 | | | P |
| 7440-48-4 | Cobalt | 3.3 | ✓ | BSK | P |
| 7440-50-8 | Copper | 1170 | | | P |
| 7439-89-6 | Iron | 49900 | | | P |
| 7439-92-1 | Lead | 40600 | | # JL | P |
| 7439-95-4 | Magnesium | 531 | ✓ | # JK BSK | P |
| 7439-96-5 | Manganese | 2540 | | | P |
| 7439-97-6 | Mercury | 15.5 | ✓ | | CV |
| 7440-02-0 | Nickel | 0.23 | ✓ | BSK | P |
| 7440-09-7 | Potassium | 350 | ✓ | BSK | P |
| 7782-49-2 | Selenium | 10.2 | | | P |
| 7440-22-4 | Silver | 60.5 | | | P |
| 7440-23-5 | Sodium | 531 | U | | P |
| 7440-28-0 | Thallium | 4.6 | | | P |
| 7440-62-2 | Vanadium | 11.2 | | | P |
| 7440-66-6 | Zinc | 1270 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

B

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

FEB 15 2005

Comments:

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

LMM
W.R.#2

MJ47T0

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08754

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 87.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 3420 | | | P |
| 7440-36-0 | Antimony | 118 | | # JL | P |
| 7440-38-2 | Arsenic | 707 | | | P |
| 7440-39-3 | Barium | 64.2 | | | P |
| 7440-41-7 | Beryllium | 0.51 | J | # JL BSK | P |
| 7440-43-9 | Cadmium | 6.5 | | | P |
| 7440-70-2 | Calcium | 184 | J | BSK | P |
| 7440-47-3 | Chromium | 4.8 | | | P |
| 7440-48-4 | Cobalt | 7.4 | | | P |
| 7440-50-8 | Copper | 1250 | | | P |
| 7439-89-6 | Iron | 55600 | | | P |
| 7439-92-1 | Lead | 10600 | | # JL | P |
| 7439-95-4 | Magnesium | 402 | J | # JL BSK | P |
| 7439-96-5 | Manganese | 1730 | | | P |
| 7439-97-6 | Mercury | 10.0 | | # | CV |
| 7440-02-0 | Nickel | 2.2 | J | BSK | P |
| 7440-09-7 | Potassium | 803 | | | P |
| 7782-49-2 | Selenium | 5.6 | | | P |
| 7440-22-4 | Silver | 14.5 | | | P |
| 7440-23-5 | Sodium | 574 | U | | P |
| 7440-28-0 | Thallium | 4.9 | | | P |
| 7440-62-2 | Vanadium | 25.2 | | | P |
| 7440-66-6 | Zinc | 1980 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

Comments:

B
FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T2

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08755

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 89.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 13700 | | | P |
| 7440-36-0 | Antimony | 0.99 | J | # U JKK | P |
| 7440-38-2 | Arsenic | 7.9 | | | P |
| 7440-39-3 | Barium | 131 | | | P |
| 7440-41-7 | Beryllium | 0.29 | J | # JK BJK | P |
| 7440-43-9 | Cadmium | 1.1 | | | P |
| 7440-70-2 | Calcium | 3360 | | | P |
| 7440-47-3 | Chromium | 6.1 | | | P |
| 7440-48-4 | Cobalt | 12.8 | | | P |
| 7440-50-8 | Copper | 19.7 | | | P |
| 7439-89-6 | Iron | 24900 | | | P |
| 7439-92-1 | Lead | 49.9 | | # JL | P |
| 7439-95-4 | Magnesium | 5350 | | # JK JK | P |
| 7439-96-5 | Manganese | 802 | | | P |
| 7439-97-6 | Mercury | 1.7 | | | CV |
| 7440-02-0 | Nickel | 4.3 | J | BJK | P |
| 7440-09-7 | Potassium | 624 | | | P |
| 7782-49-2 | Selenium | 3.9 | U | | P |
| 7440-22-4 | Silver | 1.1 | U | | P |
| 7440-23-5 | Sodium | 110 | J | BJK | P |
| 7440-28-0 | Thallium | 2.8 | U | | P |
| 7440-62-2 | Vanadium | 34.5 | | | P |
| 7440-66-6 | Zinc | 222 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifact: B

Comments:

FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T4

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08756

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 65.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|--------------|----|
| 7429-90-5 | Aluminum | 16100 | | | P |
| 7440-36-0 | Antimony | 9.1 | J | BJK # JE 45L | P |
| 7440-38-2 | Arsenic | 9.1 | | | P |
| 7440-39-3 | Barium | 131 | | | P |
| 7440-41-7 | Beryllium | 0.39 | J | # JE BJK | P |
| 7440-43-9 | Cadmium | 0.66 | J | BJK | P |
| 7440-70-2 | Calcium | 5480 | | | P |
| 7440-47-3 | Chromium | 10.6 | | | P |
| 7440-48-4 | Cobalt | 14.8 | | | P |
| 7440-50-8 | Copper | 23.6 | | | P |
| 7439-89-6 | Iron | 28400 | | | P |
| 7439-92-1 | Lead | 11.8 | | # JL | P |
| 7439-95-4 | Magnesium | 6070 | | # JE JK | P |
| 7439-96-5 | Manganese | 672 | | | P |
| 7439-97-6 | Mercury | 0.02 | J | BJK | CV |
| 7440-02-0 | Nickel | 15.6 | | | P |
| 7440-09-7 | Potassium | 707 | J | BJK | P |
| 7782-49-2 | Selenium | 5.3 | U | | P |
| 7440-22-4 | Silver | 1.5 | U | | P |
| 7440-23-5 | Sodium | 406 | J | BJK | P |
| 7440-28-0 | Thallium | 3.8 | U | | P |
| 7440-62-2 | Vanadium | 48.8 | | | P |
| 7440-66-6 | Zinc | 132 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

Comments:

B2
FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T6

Lab Name: Sentinel, Inc..

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08757

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 89.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----------|----|
| 7429-90-5 | Aluminum | 10500 | | | P |
| 7440-36-0 | Antimony | 0.63 | J | UJK # 45L | P |
| 7440-38-2 | Arsenic | 11.7 | | | P |
| 7440-39-3 | Barium | 44.2 | | | P |
| 7440-41-7 | Beryllium | 0.34 | J | # JK BJK | P |
| 7440-43-9 | Cadmium | 0.48 | J | u | P |
| 7440-70-2 | Calcium | 1140 | | | P |
| 7440-47-3 | Chromium | 5.6 | | | P |
| 7440-48-4 | Cobalt | 5.7 | | | P |
| 7440-50-8 | Copper | 9.8 | | | P |
| 7439-89-6 | Iron | 20500 | | | P |
| 7439-92-1 | Lead | 16.3 | | # IL | P |
| 7439-95-4 | Magnesium | 3410 | | # JL JK | P |
| 7439-96-5 | Manganese | 598 | | | P |
| 7439-97-6 | Mercury | 0.13 | | | CV |
| 7440-02-0 | Nickel | 4.9 | | | P |
| 7440-09-7 | Potassium | 467 | J | BJK | P |
| 7782-49-2 | Selenium | 0.52 | J | u | P |
| 7440-22-4 | Silver | 1.1 | U | | P |
| 7440-23-5 | Sodium | 82.2 | J | BJK | P |
| 7440-28-0 | Thallium | 2.8 | U | | P |
| 7440-62-2 | Vanadium | 19.9 | | | P |
| 7440-66-6 | Zinc | 111 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

Comments:

B2
FEB 15 2005

L MM
W.R.1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T7

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08758

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 86.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 2490 | | | P |
| 7440-36-0 | Antimony | 33.9 | | # JL | P |
| 7440-38-2 | Arsenic | 345 | | | P |
| 7440-39-3 | Barium | 15.4 | J | BSK | P |
| 7440-41-7 | Beryllium | 0.36 | J | # JL BSK | P |
| 7440-43-9 | Cadmium | 1.2 | | | P |
| 7440-70-2 | Calcium | 112 | J | BSK | P |
| 7440-47-3 | Chromium | 0.33 | J | BSK | P |
| 7440-48-4 | Cobalt | 3.1 | J | BSK | P |
| 7440-50-8 | Copper | 197 | | | P |
| 7439-89-6 | Iron | 30600 | | | P |
| 7439-92-1 | Lead | 3870 | | # JL | P |
| 7439-95-4 | Magnesium | 127 | J | # JL BSK | P |
| 7439-96-5 | Manganese | 1090 | | | P |
| 7439-97-6 | Mercury | 5.3 | | | CV |
| 7440-02-0 | Nickel | 0.59 | J | BSK | P |
| 7440-09-7 | Potassium | 941 | | | P |
| 7782-49-2 | Selenium | 1.5 | J | u | P |
| 7440-22-4 | Silver | 1.4 | | | P |
| 7440-23-5 | Sodium | 577 | U | | P |
| 7440-28-0 | Thallium | 2.1 | J | BSK | P |
| 7440-62-2 | Vanadium | 6.1 | | | P |
| 7440-66-6 | Zinc | 730 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: B MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:
FEB 15 2005

Comments:

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T9

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08759

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 68.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|---------|----|
| 7429-90-5 | Aluminum | 8810 | | | P |
| 7440-36-0 | Antimony | 2.4 | J | #B5L | P |
| 7440-38-2 | Arsenic | 33.0 | | | P |
| 7440-39-3 | Barium | 54.6 | | | P |
| 7440-41-7 | Beryllium | 0.56 | J | #IL BSK | P |
| 7440-43-9 | Cadmium | 0.92 | | | P |
| 7440-70-2 | Calcium | 1070 | | | P |
| 7440-47-3 | Chromium | 6.0 | | | P |
| 7440-48-4 | Cobalt | 8.2 | | | P |
| 7440-50-8 | Copper | 13.9 | | | P |
| 7439-89-6 | Iron | 22600 | | | P |
| 7439-92-1 | Lead | 39.1 | | #IL | P |
| 7439-95-4 | Magnesium | 2560 | | #IL JK | P |
| 7439-96-5 | Manganese | 807 | | | P |
| 7439-97-6 | Mercury | 0.99 | | | CV |
| 7440-02-0 | Nickel | 6.0 | | | P |
| 7440-09-7 | Potassium | 658 | J | BSK | P |
| 7782-49-2 | Selenium | 5.1 | U | | P |
| 7440-22-4 | Silver | 1.5 | U | | P |
| 7440-23-5 | Sodium | 52.5 | J | BSK | P |
| 7440-28-0 | Thallium | 3.7 | U | | P |
| 7440-62-2 | Vanadium | 18.4 | | | P |
| 7440-66-6 | Zinc | 202 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

B

Color Before: BROWN

Clarity Before:

Texture: ME 5 2005

Color After: YELLOW

Clarity After:

Artifacts:

Comments:

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W1

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08760

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 68.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 12100 | | | P |
| 7440-36-0 | Antimony | 3.9 | J | NB JL | P |
| 7440-38-2 | Arsenic | 67.6 | | | P |
| 7440-39-3 | Barium | 60.1 | | | P |
| 7440-41-7 | Beryllium | 0.52 | J | B JL BJK | P |
| 7440-43-9 | Cadmium | 0.77 | | | P |
| 7440-70-2 | Calcium | 1260 | | | P |
| 7440-47-3 | Chromium | 15.0 | | | P |
| 7440-48-4 | Cobalt | 11.7 | | | P |
| 7440-50-8 | Copper | 29.0 | | | P |
| 7439-89-6 | Iron | 29800 | | | P |
| 7439-92-1 | Lead | 55.4 | | # JL | P |
| 7439-95-4 | Magnesium | 5510 | | B JL JK | P |
| 7439-96-5 | Manganese | 921 | | | P |
| 7439-97-6 | Mercury | 0.25 | | | CV |
| 7440-02-0 | Nickel | 11.3 | | | P |
| 7440-09-7 | Potassium | 658 | J | BJK | P |
| 7782-49-2 | Selenium | 1.1 | J | u | P |
| 7440-22-4 | Silver | 1.5 | U | | P |
| 7440-23-5 | Sodium | 63.8 | J | BJK | P |
| 7440-28-0 | Thallium | 3.7 | U | | P |
| 7440-62-2 | Vanadium | 35.5 | | | P |
| 7440-66-6 | Zinc | 236 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts: B

Comments:

FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W3

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08761

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 58.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 7030 | | | P |
| 7440-36-0 | Antimony | 25.9 | | # JL | P |
| 7440-38-2 | Arsenic | 184 | | | P |
| 7440-39-3 | Barium | 261 | | | P |
| 7440-41-7 | Beryllium | 0.58 | J | # JL BJK | P |
| 7440-43-9 | Cadmium | 3.4 | | | P |
| 7440-70-2 | Calcium | 2040 | | | P |
| 7440-47-3 | Chromium | 0.93 | J | BJK | P |
| 7440-48-4 | Cobalt | 16.6 | | | P |
| 7440-50-8 | Copper | 15.6 | | | P |
| 7439-89-6 | Iron | 29900 | | | P |
| 7439-92-1 | Lead | 70.9 | | # JL | P |
| 7439-95-4 | Magnesium | 646 | J | # JL BJK | P |
| 7439-96-5 | Manganese | 16100 | | D | P |
| 7439-97-6 | Mercury | 0.40 | | | CV |
| 7440-02-0 | Nickel | 8.5 | | | P |
| 7440-09-7 | Potassium | 802 | J | BJK | P |
| 7782-49-2 | Selenium | 8.5 | | | P |
| 7440-22-4 | Silver | 1.7 | U | | P |
| 7440-23-5 | Sodium | 862 | U | | P |
| 7440-28-0 | Thallium | 1.6 | J | BJK | P |
| 7440-62-2 | Vanadium | 5.9 | J | BJK | P |
| 7440-66-6 | Zinc | 3610 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

Comments:

FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W4

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08762

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 77.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 8970 | | | P |
| 7440-36-0 | Antimony | 5.1 | J | #BJL | P |
| 7440-38-2 | Arsenic | 51.8 | | | P |
| 7440-39-3 | Barium | 30.8 | | | P |
| 7440-41-7 | Beryllium | 0.49 | J | # JK BJK | P |
| 7440-43-9 | Cadmium | 3.8 | | | P |
| 7440-70-2 | Calcium | 609 | J | BJK | P |
| 7440-47-3 | Chromium | 3.8 | | | P |
| 7440-48-4 | Cobalt | 20.5 | | | P |
| 7440-50-8 | Copper | 536 | | | P |
| 7439-89-6 | Iron | 20300 | | | P |
| 7439-92-1 | Lead | 2760 | | # JL | P |
| 7439-95-4 | Magnesium | 2620 | | # JK JK | P |
| 7439-96-5 | Manganese | 2730 | | | P |
| 7439-97-6 | Mercury | 1.3 | | | CV |
| 7440-02-0 | Nickel | 3.8 | J | BJK | P |
| 7440-09-7 | Potassium | 481 | J | BJK | P |
| 7782-49-2 | Selenium | 1.3 | J | u | P |
| 7440-22-4 | Silver | 0.27 | J | BJK | P |
| 7440-23-5 | Sodium | 644 | U | | P |
| 7440-28-0 | Thallium | 3.2 | U | | P |
| 7440-62-2 | Vanadium | 21.4 | | | P |
| 7440-66-6 | Zinc | 787 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

B

FEB 15 2005

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

Comments:

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W5

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08763

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 81.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 7150 | | | P |
| 7440-36-0 | Antimony | 8.5 | | # JL | P |
| 7440-38-2 | Arsenic | 77.2 | | | P |
| 7440-39-3 | Barium | 21.1 | J | BJK | P |
| 7440-41-7 | Beryllium | 0.39 | J | # JL BJK | P |
| 7440-43-9 | Cadmium | 3.9 | | | P |
| 7440-70-2 | Calcium | 491 | J | BJK | P |
| 7440-47-3 | Chromium | 4.0 | | | P |
| 7440-48-4 | Cobalt | 9.9 | | | P |
| 7440-50-8 | Copper | 445 | | | P |
| 7439-89-6 | Iron | 22600 | | | P |
| 7439-92-1 | Lead | 1640 | | # JL | P |
| 7439-95-4 | Magnesium | 2160 | | # JL BJK | P |
| 7439-96-5 | Manganese | 1020 | | | P |
| 7439-97-6 | Mercury | 0.62 | | | CV |
| 7440-02-0 | Nickel | 2.7 | J | BJK | P |
| 7440-09-7 | Potassium | 437 | J | BJK | P |
| 7782-49-2 | Selenium | 1.5 | J | U | P |
| 7440-22-4 | Silver | 0.57 | J | BJK | P |
| 7440-23-5 | Sodium | 617 | U | | P |
| 7440-28-0 | Thallium | 1.5 | J | BJK | P |
| 7440-62-2 | Vanadium | 17.2 | | | P |
| 7440-66-6 | Zinc | 709 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

FEB 15 2005

Comments:

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W8

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08764

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 71.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|--------|----|
| 7429-90-5 | Aluminum | 9600 | | | P |
| 7440-36-0 | Antimony | 3.8 | J | #BJL | P |
| 7440-38-2 | Arsenic | 47.9 | | | P |
| 7440-39-3 | Barium | 70.5 | | | P |
| 7440-41-7 | Beryllium | 0.38 | J | #JLBJK | P |
| 7440-43-9 | Cadmium | 0.82 | | | P |
| 7440-70-2 | Calcium | 1100 | | | P |
| 7440-47-3 | Chromium | 6.4 | | | P |
| 7440-48-4 | Cobalt | 7.4 | | | P |
| 7440-50-8 | Copper | 15.7 | | | P |
| 7439-89-6 | Iron | 23000 | | | P |
| 7439-92-1 | Lead | 150 | | #JL | P |
| 7439-95-4 | Magnesium | 3430 | | #JLBJK | P |
| 7439-96-5 | Manganese | 930 | | | P |
| 7439-97-6 | Mercury | 0.26 | | | CV |
| 7440-02-0 | Nickel | 5.0 | J | BJK | P |
| 7440-09-7 | Potassium | 563 | J | BJK | P |
| 7782-49-2 | Selenium | 0.83 | J | u | P |
| 7440-22-4 | Silver | 1.4 | U | | P |
| 7440-23-5 | Sodium | 64.6 | J | BJK | P |
| 7440-28-0 | Thallium | 1.6 | J | BJK | P |
| 7440-62-2 | Vanadium | 18.9 | | | P |
| 7440-66-6 | Zinc | 234 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts: FEB 15 2005

Comments:

LMM
STAMP MILL1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W9

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08765

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 76.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|----------|----|
| 7429-90-5 | Aluminum | 7160 | | | P |
| 7440-36-0 | Antimony | 38.2 | | # JL | P |
| 7440-38-2 | Arsenic | 248 | | | P |
| 7440-39-3 | Barium | 23.5 | J | BSK | P |
| 7440-41-7 | Beryllium | 0.34 | J | # JE BSK | P |
| 7440-43-9 | Cadmium | 1.5 | | | P |
| 7440-70-2 | Calcium | 486 | J | BSK | P |
| 7440-47-3 | Chromium | 4.5 | | | P |
| 7440-48-4 | Cobalt | 8.0 | | | P |
| 7440-50-8 | Copper | 466 | | | P |
| 7439-89-6 | Iron | 33500 | | | P |
| 7439-92-1 | Lead | 5850 | | # JL | P |
| 7439-95-4 | Magnesium | 679 | | # JE SK | P |
| 7439-96-5 | Manganese | 1250 | | | P |
| 7439-97-6 | Mercury | 24.3 | | | CV |
| 7440-02-0 | Nickel | 2.3 | J | BSK | P |
| 7440-09-7 | Potassium | 527 | J | BSK | P |
| 7782-49-2 | Selenium | 3.7 | J | BSK | P |
| 7440-22-4 | Silver | 9.5 | | | P |
| 7440-23-5 | Sodium | 656 | U | | P |
| 7440-28-0 | Thallium | 2.3 | J | BSK | P |
| 7440-62-2 | Vanadium | 18.0 | | | P |
| 7440-66-6 | Zinc | 526 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

B
FEB 15 2005

Comments:

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47X1

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08766

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 83.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|---------|----|
| 7429-90-5 | Aluminum | 8350 | | | P |
| 7440-36-0 | Antimony | 0.65 | J | # UJKK | P |
| 7440-38-2 | Arsenic | 20.5 | | | P |
| 7440-39-3 | Barium | 140 | | | P |
| 7440-41-7 | Beryllium | 0.65 | | # JK JK | P |
| 7440-43-9 | Cadmium | 0.19 | J | u | P |
| 7440-70-2 | Calcium | 1610 | | | P |
| 7440-47-3 | Chromium | 4.2 | | | P |
| 7440-48-4 | Cobalt | 5.8 | J | BSK | P |
| 7440-50-8 | Copper | 7.3 | | | P |
| 7439-89-6 | Iron | 25900 | | | P |
| 7439-92-1 | Lead | 9.4 | | # JL | P |
| 7439-95-4 | Magnesium | 1640 | | # JK JK | P |
| 7439-96-5 | Manganese | 824 | | | P |
| 7439-97-6 | Mercury | 0.04 | J | BSK | CV |
| 7440-02-0 | Nickel | 2.8 | J | BSK | P |
| 7440-09-7 | Potassium | 833 | | | P |
| 7782-49-2 | Selenium | 0.90 | J | u | P |
| 7440-22-4 | Silver | 1.2 | U | | P |
| 7440-23-5 | Sodium | 97.4 | J | BSK | P |
| 7440-28-0 | Thallium | 3.0 | U | | P |
| 7440-62-2 | Vanadium | 20.9 | | | P |
| 7440-66-6 | Zinc | 40.0 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM

11-16-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

FEB 15 2005

Comments:

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47X3

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08767

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 89.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|---------|----|
| 7429-90-5 | Aluminum | 13200 | | | P |
| 7440-36-0 | Antimony | 12.4 | | # JL | P |
| 7440-38-2 | Arsenic | 90.8 | | | P |
| 7440-39-3 | Barium | 81.2 | | | P |
| 7440-41-7 | Beryllium | 0.56 | | # JL JK | P |
| 7440-43-9 | Cadmium | 3.2 | | | P |
| 7440-70-2 | Calcium | 1270 | | | P |
| 7440-47-3 | Chromium | 12.1 | | | P |
| 7440-48-4 | Cobalt | 13.3 | | | P |
| 7440-50-8 | Copper | 206 | | | P |
| 7439-89-6 | Iron | 25600 | | | P |
| 7439-92-1 | Lead | 590 | | # JL | P |
| 7439-95-4 | Magnesium | 5090 | | # JL JK | P |
| 7439-96-5 | Manganese | 740 | | | P |
| 7439-97-6 | Mercury | 1.4 | | | CV |
| 7440-02-0 | Nickel | 6.2 | | | P |
| 7440-09-7 | Potassium | 456 | J | 3JK | P |
| 7782-49-2 | Selenium | 1.5 | J | u | P |
| 7440-22-4 | Silver | 1.7 | | | P |
| 7440-23-5 | Sodium | 557 | U | | P |
| 7440-28-0 | Thallium | 2.8 | U | | P |
| 7440-62-2 | Vanadium | 32.1 | | | P |
| 7440-66-6 | Zinc | 538 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts: FEB 15 2005

Comments:

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47X5

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Matrix: (soil/water) SOIL

Lab Sample ID: 08768

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 86.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|---------|----|
| 7429-90-5 | Aluminum | 13100 | | | P |
| 7440-36-0 | Antimony | 0.50 | J | # UJKK | P |
| 7440-38-2 | Arsenic | 26.2 | | | P |
| 7440-39-3 | Barium | 71.6 | | | P |
| 7440-41-7 | Beryllium | 0.70 | | # JK JK | P |
| 7440-43-9 | Cadmium | 0.83 | | | P |
| 7440-70-2 | Calcium | 1790 | | | P |
| 7440-47-3 | Chromium | 2.3 | | | P |
| 7440-48-4 | Cobalt | 8.2 | | | P |
| 7440-50-8 | Copper | 18.0 | | | P |
| 7439-89-6 | Iron | 21800 | | | P |
| 7439-92-1 | Lead | 54.8 | | # JL | P |
| 7439-95-4 | Magnesium | 3410 | | # JK JK | P |
| 7439-96-5 | Manganese | 903 | | | P |
| 7439-97-6 | Mercury | 0.01 | J | BJK | CV |
| 7440-02-0 | Nickel | 3.3 | J | BJK | P |
| 7440-09-7 | Potassium | 512 | J | BJK | P |
| 7782-49-2 | Selenium | 0.61 | J | u | P |
| 7440-22-4 | Silver | 1.2 | U | | P |
| 7440-23-5 | Sodium | 576 | U | | P |
| 7440-28-0 | Thallium | 2.9 | U | | P |
| 7440-62-2 | Vanadium | 22.9 | | | P |
| 7440-66-6 | Zinc | 176 | | | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-10-04

Color Before: BROWN

Clarity Before:

Texture: MEDIUM

Color After: YELLOW

Clarity After:

Artifacts:

FEB 15 2005

Comments:

USEPA - CLP

9-IN
METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Instrument Type: P

Instrument ID: P3

Date: 07/01/2004

Preparation Method: HSL

Concentration Units (ug/L or mg/kg): MG/KG

| Analyte | Wavelength
/Mass | CRQL | MDL |
|-----------|---------------------|------|-------|
| Aluminum | 308.20 | 20 | 0.48 |
| Antimony | 206.80 | 6 | 0.23 |
| Arsenic | 189.00 | 1 | 0.26 |
| Barium | 493.40 | 20 | 0.13 |
| Beryllium | 313.00 | 0.5 | 0.010 |
| Cadmium | 226.50 | 0.5 | 0.079 |
| Calcium | 317.90 | 500 | 91.0 |
| Chromium | 267.70 | 1 | 0.093 |
| Cobalt | 228.60 | 5 | 0.12 |
| Copper | 324.70 | 2.5 | 0.23 |
| Iron | 271.40 | 10 | 1.6 |
| Lead | 220.30 | 1 | 0.26 |
| Magnesium | 279.00 | 500 | 4.7 |
| Manganese | 257.60 | 1.5 | 0.025 |
| Mercury | | 0.1 | |
| Nickel | 231.60 | 4 | 0.14 |
| Potassium | 766.40 | 500 | 3.4 |
| Selenium | 196.00 | 3.5 | 0.40 |
| Silver | 328.00 | 1 | 0.15 |
| Sodium | 330.20 | 500 | 31.1 |
| Thallium | 190.80 | 2.5 | 0.79 |
| Vanadium | 292.40 | 5 | 0.11 |
| Zinc | 206.20 | 6 | 1.4 |
| Cyanide | | 2.5 | |

Comments:

P3: THERMO JARRELL ASH

USEPA - CLP

9-IN
METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Instrument Type: P

Instrument ID: P4

Date: 07/01/2004

Preparation Method: HS1

Concentration Units (ug/L or mg/kg): MG/KG

| Analyte | Wavelength
/Mass | CRQL | MDL |
|-----------|---------------------|------|-------|
| Aluminum | | 20 | |
| Antimony | | 6 | |
| Arsenic | | 1 | |
| Barium | | 20 | |
| Beryllium | | 0.5 | |
| Cadmium | | 0.5 | |
| Calcium | | 500 | |
| Chromium | | 1 | |
| Cobalt | | 5 | |
| Copper | | 2.5 | |
| Iron | | 10 | |
| Lead | 220.30 | 1 | 0.13 |
| Magnesium | | 500 | |
| Manganese | 257.60 | 1.5 | 0.009 |
| Mercury | | 0.1 | |
| Nickel | | 4 | |
| Potassium | | 500 | |
| Selenium | | 3.5 | |
| Silver | | 1 | |
| Sodium | | 500 | |
| Thallium | | 2.5 | |
| Vanadium | | 5 | |
| Zinc | | 6 | |
| Cyanide | | 2.5 | |

Comments:

P4: THERMO JARRELL ASH

USEPA - CLP

9-IN

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Instrument Type: CV

Instrument ID: C6

Date: 01/15/2004

Preparation Method: CS1

Concentration Units (ug/L or mg/kg): MG/KG

| Analyte | Wavelength
/Mass | CRQL | MDL |
|-----------|---------------------|------|-------|
| Aluminum | | 20 | |
| Antimony | | 6 | |
| Arsenic | | 1 | |
| Barium | | 20 | |
| Beryllium | | 0.5 | |
| Cadmium | | 0.5 | |
| Calcium | | 500 | |
| Chromium | | 1 | |
| Cobalt | | 5 | |
| Copper | | 2.5 | |
| Iron | | 10 | |
| Lead | | 1 | |
| Magnesium | | 500 | |
| Manganese | | 1.5 | |
| Mercury | 253.70 | 0.1 | 0.008 |
| Nickel | | 4 | |
| Potassium | | 500 | |
| Selenium | | 3.5 | |
| Silver | | 1 | |
| Sodium | | 500 | |
| Thallium | | 2.5 | |
| Vanadium | | 5 | |
| Zinc | | 6 | |
| Cyanide | | 2.5 | |

Comments:

C6: CETAC M6000

12-IN
PREPARATION LOG

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No. :

SDG No. : MJ47S7

Preparation Method: HS1

[illegible]

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USEPA - CLP

12-IN
PREPARATION LOG

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47S7

Preparation Method: CS1

| EPA
Sample No. | Preparation
Date | Weight
(gram) | Volume
(mL) |
|-------------------|---------------------|------------------|----------------|
| CCB | 10/22/2004 | | 100 |
| CCV | 10/22/2004 | | 100 |
| CRI | 10/22/2004 | | 100 |
| ICB | 10/22/2004 | | 100 |
| ICV | 10/22/2004 | | 100 |
| LCSS | 10/22/2004 | 0.20 | 100 |
| MJ47S7 | 10/22/2004 | 0.20 | 100 |
| MJ47S7D | 10/22/2004 | 0.20 | 100 |
| MJ47S7S | 10/22/2004 | 0.20 | 100 |
| MJ47S8 | 10/22/2004 | 0.20 | 100 |
| MJ47S9 | 10/22/2004 | 0.20 | 100 |
| MJ47T0 | 10/22/2004 | 0.20 | 100 |
| MJ47T2 | 10/22/2004 | 0.20 | 100 |
| MJ47T4 | 10/22/2004 | 0.20 | 100 |
| MJ47T6 | 10/22/2004 | 0.20 | 100 |
| MJ47T7 | 10/22/2004 | 0.20 | 100 |
| MJ47T9 | 10/22/2004 | 0.20 | 100 |
| MJ47W1 | 10/22/2004 | 0.20 | 100 |
| MJ47W3 | 10/22/2004 | 0.20 | 100 |
| MJ47W4 | 10/22/2004 | 0.20 | 100 |
| MJ47W5 | 10/22/2004 | 0.20 | 100 |
| MJ47W8 | 10/22/2004 | 0.20 | 100 |
| MJ47W9 | 10/22/2004 | 0.20 | 100 |
| MJ47X1 | 10/22/2004 | 0.20 | 100 |
| MJ47X3 | 10/22/2004 | 0.20 | 100 |
| MJ47X5 | 10/22/2004 | 0.20 | 100 |
| PBS | 10/22/2004 | 0.20 | 100 |
| S0 | 10/22/2004 | | 100 |
| S0.2 | 10/22/2004 | | 100 |
| S1.0 | 10/22/2004 | | 100 |
| S10.0 | 10/22/2004 | | 100 |
| S2.0 | 10/22/2004 | | 100 |
| S5.0 | 10/22/2004 | | 100 |



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

November 9, 2004

Reply To
Attn. Of: OEA-095

MEMORANDUM

SUBJECT: Data Validation for Musick Mine PA/SI, Case# 33419,
SDG: MJ47T1, Metals Analysis

FROM: Donald Matheny, Chemist *DM*
Technical Support Unit, OEA

TO: Joanne LaBaw, Regional Project Manager
Office of Environmental Cleanup

CC: David Dinkuhn, Weston Solutions

The data validation of metals analysis for the above sample set is complete. Eleven (11) water samples were analyzed for metals by Sentinel Inc., Huntsville, AL. Sample numbers for this delivery group are as follows:

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| MJ47T1 | MJ47T3 | MJ47T5 | MJ47T8 | MJ47W0 | MJ47W2 |
| MJ47W6 | MJ47W7 | MJ47X0 | MJ47X2 | MJ47X4 | |

DATA QUALIFICATIONS

The following comments refer to the lab's performance in meeting quality control specifications outlined in the "CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM05.3", the "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540/R-94-013" and the judgment of the reviewer. The comments presented herein are based on the information provided for the review.

1.0 TIMELINESS - Acceptable

The holding time from the date of collection to the date of digestion and analyses were met for all metals (metals 180 days, mercury 28 days). Samples were collected on 10/12/04 thru 10/14/04. ICP-AES analysis was conducted on 10/23/04 and mercury analysis on 10/22/04.

2.0 INSTRUMENT CALIBRATION/VERIFICATION - Acceptable

For ICP-AES analysis, instrument calibration was performed in accordance with method requirements. Recoveries for instrument verification standards (97-106%) met the frequency (10%) and recovery (90-110%) criteria.

For mercury analysis, the instrument was calibrated with a blank and five standards. The correlation coefficient (0.999) met the criterion (≥ 0.995). Recoveries for verification standards (89-105%) met the frequency (10%) and recovery (80-120%) criteria.

Quantitation verification standards met both the frequency and recovery criteria for all metals.

3.0 ICP-AES INTERFERENCE CHECK SAMPLE (ICS) - Acceptable

An ICS was analyzed at the required frequency for each analytical run. ICS recoveries met the recovery criterion (80-120% or $\pm 2 \times \text{CRDL}$) for all metals.

4.0 LABORATORY CONTROL SAMPLES (LCS) - Acceptable

All metals results (99-106%) for the LCS were within the established control limits (80-120%) for waters.

5.0 BLANKS

Preparation and instrument control blanks were prepared and analyzed in accordance with method requirements. Blank results were either non-detected or below a factor that could impact analytical sample results with the exception of aluminum, barium, beryllium, cadmium, copper, manganese and zinc. Affected samples were qualified (U) for these analytes.

6.0 MATRIX SPIKE ANALYSIS - Acceptable

A matrix spike analysis was performed for sample MJ47W7. The percent recovery range for this sample (93-118%) was within the recovery criterion (75-125%) for metals.

7.0 DUPLICATE SAMPLE ANALYSIS - Acceptable

A duplicate sample analysis was performed for sample MJ47W7. The range of relative percent differences ($\leq 8\%$) for this sample was within the control limits ($\pm 20\%$ or $\pm \text{CRDL}$) for waters.

8.0 ICP-AES SERIAL DILUTION - Acceptable

A five-fold serial dilution was performed for sample MJ47W7. Percent differences ($\leq 4\%$) were within the control criterion ($\leq 10\%$) for all applicable metals.

9.0 ASSESSMENT SUMMARY

The following is a summary of qualified data: The (J) qualifier applied by the laboratory, represents results that are estimated. These values fall within a concentration range that is above the method detection limit but below the laboratory's quantitation limit. A number of reported values for aluminum, barium, beryllium, cadmium, copper, manganese and zinc were qualified (U) due to the detected presence of these analytes in the preparation and/or instrument verification blanks.

DATA QUALIFIERS

- U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- J - The associated value is an estimated quantity.
- R - The data are unusable. The analyte may or may not be present in the sample.
- UJ - The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

PROJECT SPECIFIC DATA QUALIFIERS:

- L - Low bias.
- H - High bias.
- K - Unknown Bias.

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T1

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08740

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 243 | | u | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 6.7 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 6000 | | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 100 | U | | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 1130 | J | BJK | P |
| 7439-96-5 | Manganese | 15.0 | U | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 540 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 3330 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 4.1 | J | u | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

B
FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T3

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08741

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 255 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 6.4 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 12000 | | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 100 | U | | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 2210 | J | BJK | P |
| 7439-96-5 | Manganese | 8.5 | J | BJK | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 629 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 4820 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 5.2 | J | u | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T5

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08742

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 224 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 11.9 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 0.26 | J | u | P |
| 7440-70-2 | Calcium | 15400 | | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 100 | U | | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 2340 | J | BJK | P |
| 7439-96-5 | Manganese | 1.3 | J | BJK | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 509 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 3170 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 6.1 | J | BJK | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

FEB 15 2005

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USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47T8

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08743

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 220 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 13.3 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 17700 | | | P |
| 7440-47-3 | Chromium | 0.50 | J | BJK | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 100 | U | | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 2370 | J | BJK | P |
| 7439-96-5 | Manganese | 1.8 | J | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 535 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 3330 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 6.6 | J | BJK | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W0

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08744

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 273 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 14.6 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 19300 | | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 60.6 | J | BJK | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 2450 | J | BJK | P |
| 7439-96-5 | Manganese | 9.1 | J | BJK | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 622 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 3350 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 7.7 | J | BJK | P |
| 57-12-5 | Cyanide | | | | NR |

DM
11-9-04

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

B
FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W2

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08745

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 210 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 31.4 | J | | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 40300 | | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 443 | | | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 6190 | | | P |
| 7439-96-5 | Manganese | 351 | | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 659 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 4280 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 175 | | | P |
| 57-12-5 | Cyanide | | | | NR |

24
11-9-04

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

12
FEB 15 2005

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USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W6

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08746

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 2290 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 24.3 | | | P |
| 7440-39-3 | Barium | 6.3 | J | u | P |
| 7440-41-7 | Beryllium | 0.26 | J | u | P |
| 7440-43-9 | Cadmium | 48.5 | | | P |
| 7440-70-2 | Calcium | 13700 | | | P |
| 7440-47-3 | Chromium | 1.9 | J | BSK | P |
| 7440-48-4 | Cobalt | 8.4 | J | BSK | P |
| 7440-50-8 | Copper | 650 | | | P |
| 7439-89-6 | Iron | 4230 | | | P |
| 7439-92-1 | Lead | 544 | | | P |
| 7439-95-4 | Magnesium | 3460 | J | BSK | P |
| 7439-96-5 | Manganese | 674 | | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 6.3 | J | BSK | P |
| 7440-09-7 | Potassium | 431 | J | BSK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 1690 | J | BSK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 9010 | | | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47W7

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08747

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 207 | | u | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 11.2 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 2940 | J | BJK | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 100 | U | | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 414 | J | BJK | P |
| 7439-96-5 | Manganese | 15.0 | U | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 253 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 1690 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 5.9 | J | u | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

FEB 15 2005

USEPA - CLP

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47X0

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08748

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 236 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 27.7 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 9540 | | | P |
| 7440-47-3 | Chromium | 0.55 | J | BJK | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 26.3 | J | BJK | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 1940 | J | BJK | P |
| 7439-96-5 | Manganese | 1.5 | J | u | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 971 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 4970 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 12.3 | J | BJK | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Analyte:

Comments:

FEB 15 2005

1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47X2

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08749

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 246 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 13.4 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 2890 | J | BJK | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 3.5 | J | u | P |
| 7439-89-6 | Iron | 100 | U | | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 498 | J | BJK | P |
| 7439-96-5 | Manganese | 15.0 | U | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 382 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 2380 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 5.4 | J | BJK | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

FEB 15 2005

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1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ47X4

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Matrix: (soil/water) WATER

Lab Sample ID: 08750

Level: (low/med) LOW

Date Received: 10/16/2004

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|-----------|-----------|---------------|---|-----|----|
| 7429-90-5 | Aluminum | 237 | | | P |
| 7440-36-0 | Antimony | 60.0 | U | | P |
| 7440-38-2 | Arsenic | 10.0 | U | | P |
| 7440-39-3 | Barium | 8.6 | J | u | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 2820 | J | BJK | P |
| 7440-47-3 | Chromium | 0.91 | J | BJK | P |
| 7440-48-4 | Cobalt | 50.0 | U | | P |
| 7440-50-8 | Copper | 25.0 | U | | P |
| 7439-89-6 | Iron | 100 | U | | P |
| 7439-92-1 | Lead | 10.0 | U | | P |
| 7439-95-4 | Magnesium | 500 | J | BJK | P |
| 7439-96-5 | Manganese | 0.63 | J | u | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 40.0 | U | | P |
| 7440-09-7 | Potassium | 407 | J | BJK | P |
| 7782-49-2 | Selenium | 35.0 | U | | P |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 2870 | J | BJK | P |
| 7440-28-0 | Thallium | 25.0 | U | | P |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 60.0 | U | | P |
| 57-12-5 | Cyanide | | | | NR |

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

B
FEB 15 2005

USEPA - CLP

9-IN
METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Instrument Type: P

Instrument ID: P4

Date: 01/15/2004

Preparation Method: HW1

Concentration Units (ug/L or mg/kg): UG/L

| Analyte | Wavelength
/Mass | CRQL | MDL |
|-----------|---------------------|------|------|
| Aluminum | 308.20 | 200 | 92.1 |
| Antimony | 206.80 | 60 | 4.9 |
| Arsenic | 189.00 | 10 | 3.8 |
| Barium | 493.40 | 200 | 1.8 |
| Beryllium | 313.00 | 5 | 0.11 |
| Cadmium | 226.50 | 5 | 0.24 |
| Calcium | 317.90 | 5000 | 59.8 |
| Chromium | 267.70 | 10 | 0.49 |
| Cobalt | 228.60 | 50 | 0.92 |
| Copper | 324.70 | 25 | 1.3 |
| Iron | 271.40 | 100 | 23.3 |
| Lead | 220.30 | 10 | 2.7 |
| Magnesium | 279.00 | 5000 | 43.4 |
| Manganese | 257.60 | 15 | 0.23 |
| Mercury | | 0.2 | |
| Nickel | 231.60 | 40 | 1.2 |
| Potassium | 766.40 | 5000 | 155 |
| Selenium | 196.00 | 35 | 2.9 |
| Silver | 328.00 | 10 | 1.4 |
| Sodium | 330.20 | 5000 | 662 |
| Thallium | 190.80 | 25 | 8.0 |
| Vanadium | 292.40 | 50 | 0.88 |
| Zinc | 206.20 | 60 | 0.77 |
| Cyanide | | 10 | |

Comments:

P4: THERMO JARRELL ASH

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USEPA - CLP

9-IN
METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Instrument Type: CV

Instrument ID: C6

Date: 01/15/2004

Preparation Method: CW1

Concentration Units (ug/L or mg/kg): UG/L

| Analyte | Wavelength
/Mass | CRQL | MDL |
|-----------|---------------------|------|-------|
| Aluminum | | 200 | |
| Antimony | | 60 | |
| Arsenic | | 10 | |
| Barium | | 200 | |
| Beryllium | | 5 | |
| Cadmium | | 5 | |
| Calcium | | 5000 | |
| Chromium | | 10 | |
| Cobalt | | 50 | |
| Copper | | 25 | |
| Iron | | 100 | |
| Lead | | 10 | |
| Magnesium | | 5000 | |
| Manganese | | 15 | |
| Mercury | 253.70 | 0.2 | 0.023 |
| Nickel | | 40 | |
| Potassium | | 5000 | |
| Selenium | | 35 | |
| Silver | | 10 | |
| Sodium | | 5000 | |
| Thallium | | 25 | |
| Vanadium | | 50 | |
| Zinc | | 60 | |
| Cyanide | | 10 | |

Comments:

C6: CETAC M6000

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12-IN
PREPARATION LOG

Contract: 68-W-04-007

SDG No.: MJ47T1

[illegible]

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USEPA - CLP

12-IN
PREPARATION LOG

Lab Name: Sentinel, Inc.

Contract: 68-W-04-007

Lab Code: SENTIN

Case No.: 33419

NRAS No.:

SDG No.: MJ47T1

Preparation Method: CW1

| EPA
Sample No. | Preparation
Date | Weight
(gram) | Volume
(mL) |
|-------------------|---------------------|------------------|----------------|
| CCB | 10/21/2004 | | 100 |
| CCV | 10/21/2004 | | 100 |
| CRI | 10/21/2004 | | 100 |
| ICB | 10/21/2004 | | 100 |
| ICV | 10/21/2004 | | 100 |
| MJ47T1 | 10/21/2004 | | 100 |
| MJ47T3 | 10/21/2004 | | 100 |
| MJ47T5 | 10/21/2004 | | 100 |
| MJ47T8 | 10/21/2004 | | 100 |
| MJ47W0 | 10/21/2004 | | 100 |
| MJ47W2 | 10/21/2004 | | 100 |
| MJ47W6 | 10/21/2004 | | 100 |
| MJ47W7 | 10/21/2004 | | 100 |
| MJ47W7D | 10/21/2004 | | 100 |
| MJ47W7S | 10/21/2004 | | 100 |
| MJ47X0 | 10/21/2004 | | 100 |
| MJ47X2 | 10/21/2004 | | 100 |
| MJ47X4 | 10/21/2004 | | 100 |
| PBW | 10/21/2004 | | 100 |
| S0 | 10/21/2004 | | 100 |
| S0.2 | 10/21/2004 | | 100 |
| S1.0 | 10/21/2004 | | 100 |
| S10.0 | 10/21/2004 | | 100 |
| S2.0 | 10/21/2004 | | 100 |
| S5.0 | 10/21/2004 | | 100 |
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